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Research Article

Nutritional Status of Elderly Patients with Type 2 Diabetes Mellitus in the North West Region of Cameroon

État Nutritionnel des Patients Âgés Diabétiques de Type 2 dans la Région du Nord-Ouest du Cameroun

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ABSTRACT

Introduction. In Cameroon, the data on the burden of undernutrition among elderly patients with type 2 diabetes are scarce. We aimed to assess the nutritional status of elderly patients with type 2 diabetes mellitus followed at Bamenda Regional Hospital. **Methodology.** We conducted a cross-sectional study at the diabetic unit and the hemodialysis center of the Bamenda Regional Hospital. The study population consisted of 146 outpatients aged 60 years and above, with type 2 diabetes mellitus attending the consultation from February to May 2023 who gave their informed consent. Nutritional status was assessed using MNA-SF and GLIM criteria. Data were collected using a pretested questionnaire and analyzed using the computer software SPSS version 26. **Results.** The mean age was 68.7 years. Normal BMI was found in 35.6% (n=52) of participants whereas 1.4% (n=2) had a BMI below 18.5kg/m^2. The prevalence of undernutrition in elderly patients with type 2 diabetes mellitus was 12.3% according to the MNA-SF and 15.1% according to the GLIM criteria. A poor fasting blood glucose, a normal body mass index, waist circumference, and serum albumin levels summarized the clinical and biological presentation of the undernourished participants. There was a strong association between age above 70 years and undernutrition [OR 4.1(95% CI: 1.48-11.3)] but not with diabetes duration. **Conclusion.** The prevalence of undernutrition in elderly patients with type 2 diabetes mellitus was 12.3% and 15.1% with respect to the screening tool used. There was a four-fold increase in the risk of undernutrition in patients above 70 years.

RÉSUMÉ

Introduction. Au Cameroun, les données sur le poids de la dénutrition chez les patients âgés atteints de diabète de type 2 sont rares. Ce travail a pour but de décrire l'état nutritionnel des patients âgés atteints de diabète de type 2 suivis à l'hôpital régional de Bamenda. **Méthodologie.** Nous avons mené une étude transversale à l'unité de diabétologie et au centre d'hémodialyse de l'hôpital régional de Bamenda. La population étudiée était constituée de 146 patients ambulatoires âgés de 60 ans et plus, atteints de diabète sucré de type 2 et fréquentant la consultation de février à mai 2023, qui ont donné leur consentement éclairé. L'état nutritionnel a été évalué à l'aide des critères MNA-SF et GLIM. Les données ont été recueillies à l'aide d'un questionnaire pré-testé et analysées à l'aide du logiciel informatique SPSS version 26. **Résultats.** L'âge moyen était de 68,7 ans. L'IMC était normal chez 35,6 % (n=52) des participants, tandis que 1,4 % (n=2) avaient un IMC inférieur à 18,5 kg/m2. La prévalence de la dénutrition chez les patients âgés atteints de diabète de type 2 était de 12,3 % selon les critères MNA-SF et de 15,1 % selon les critères GLIM. Une mauvaise glycémie à jeun, un indice de masse corporelle, un tour de taille et un taux d'albumine sérique normaux résumaient la présentation clinique et biologique des participants dénutris. Il y avait une forte association entre l'âge supérieur à 70 ans et la dénutrition [OR 4.1 (95% CI : 1.48-11.3)] mais pas avec la durée du diabète. **Conclusion.** La prévalence de la dénutrition chez les patients âgés atteints de diabète de type 2 était de 12,3 % et de 15,1 % selon l'outil de dépistage utilisé. Le risque de dénutrition était multiplié par quatre chez les patients âgés de plus de 70 ans.

HIGHLIGHTS

What is known of the subject

In Cameroon, the data on the burden of undernutrition among elderly patients with type 2 diabetes are scarce.

The aim of our study

Nutritional status of elderly patients with type 2 diabetes mellitus followed at Bamenda Regional Hospital.

Key Results

1. The mean age was 68.7 years. Normal BMI was found in 35.6% (n=52) of participants whereas 1.4% (n=2) had a BMI below 18.5kg/m^2.
2. The prevalence of undernutrition in elderly patients with type 2 diabetes mellitus was 12.3% according to the MNA-SF and 15.1% according to the GLIM criteria.
3. Poor fasting blood glucose, a normal body mass index, waist circumference, and serum albumin levels summarized the clinical and biological presentation of the undernourished participants.
4. There was a strong association between age above 70 years and undernutrition [OR 4.1(95% CI: 1.48-11.3)] but not with diabetes duration.

Implications for future practices and policies

The study provides evidence to support the systematic assessment of nutritional status in elderly patients living with type 2 diabetes. This will allow timely prevention and early management of undernutrition in this group of patients.

INTRODUCTION

According to the United Nations, an older or elderly person is one who is over 60 years of age[1]. However, the elderly population also refers to persons who have a chronological age of 65 years or above as defined based on a range of social, cultural and medical considerations[2]. The proportion of people aged 60 years and older was estimated at 1 billion in 2020 and this is expected to increase to 1.4 billion by 2030. While this increase concerns all continents, the greatest change will be experienced in low- and middle-income countries[3]. This population presents with peculiarities such as decrease of their functional reserve and frailty which exposes them to a subclinical inflammatory state and other geriatric syndromes. Older patients are reported to have different physiological profiles and varying functional capacity and life expectancy[4]. Aging comes with multiple health-related issues such as functional disability, impairment of higher mental functions and nutritional disorders. Moreover, there is a higher risk of occurrence of noncommunicable diseases such as hypertension and type 2 diabetes mellitus[3]. Diabetes mellitus is defined by the IDF as a chronic condition that occurs when the pancreas can no longer make insulin or the body cannot effectively use insulin[5]. Diabetes mellitus is a growing problem in most parts of the world. It has been recognised as a global health emergency both in developed and developing countries given its detrimental impact on health and the socio-economic burden it causes. About 55% of all diabetes mellitus cases in the United States occurs in the elderly. Other studies report that diabetes affects about 50% of the elderly with frequencies varying between 18% and 33%[6]. In 2015,a systematic review of data reported that about 18.8% of diabetes patients in Africa fall between the age group 60-79 years[7]. There is an increase prevalence of diabetes complications and comorbidities among the elderly when compared to their younger counterparts. Comorbidities such as visual and cognitive decline and atherosclerotic cardiovascular disease constitute the major burden among the elderly diabetes population[8]. Assessing the nutritional status of elderly patients with type 2 diabetes is crucial as it has been shown to improve the prognosis of this group of diabetes patients. Although overweight and obesity are common findings among elderly type 2 diabetes mellitus patients, undernutrition may occur and is associated with a poor prognosis[9]. The risk of malnutrition was estimated to be 1.4 times higher among hospitalized diabetes patients in Spain[10]. Sanz-Paris *et al.* in 2013 estimated malnutrition rate at 21.1% in geriatric patients with diabetes irrespective of their body mass index[11]. In Cameroon, a cross-sectional study conducted by Mabiama et al. in 2018 through 2020 reported a prevalence of undernutrition at 19.7% among Cameroonians aged above 60 years[12]. Given that data on the burden of undernutrition among elderly patients with diabetes are scarce in our context, we aimed to assess the nutritional status of elderly patients with type 2 diabetes mellitus at Bamenda Regional Hospital.

PATIENTS AND METHODS

This Study design, setting and population

This was a cross-sectional study that took place from February to May 2023 at the diabetic unit and the consultation unit of the haemodialysis centre of the Bamenda Regional Hospital, a tertiary Hospital in Bamenda, Cameroon. T2DM patients aged 60 years and above attending the out-patient department mentioned above for their routine visit were consecutively recruited during their routine diabetes clinic consultations.

Sampling and sample size

We used a non-probabilist consecutive and exhaustive sampling method in this study. Sample size was calculated using Cochran's formula. Considering an estimated proportion of undernutition in patients with type 2 diabetes of 13.1% as reported in a systematic review performed in 2015 on the prevalence of type 2 diabetes mellitus among older people in Africa[13], with 95% confidence interval and a Z score of 1.96, the minimum sample size of this study was estimated 175 participants.

Data collection

Sociodemographic (age, gender, education levels, occupation, marital status) and clinical (heart failure, hepatocellular insufficiency, smoking, alcohol, coronary artery disease, stroke, neoplasia) characteristics of participants were collected during a face-to-face interview using a pre-tested data collection form. After the interview, physical parameters were measured for each participant of the study.

Clinical and physical examination

In all participants, height (to the nearest 0.5 cm) was measured using a wall-stuck stadiometer. The waist circumference (to the nearest 0.1 cm) was measured at the midway between the lower costal margin and the iliac crest, while the person was in the upright position, using a nonstretchable tape. Weight was measured using a mechanical scale. The BMI was calculated as the weight (in kilograms) divided by the square of the height (in meters). Mid upper arm circumference measurement (MUAC) was measured to the nearest 0.1 cm using a nonstretchable tape, at the mid-point between the tip of the acromion and the olecranon process on the back of the arm while the participant held the forearm in horizontal position. The widest calf circumference was measured between the ankle and knee to the nearest 0.1 cm using non-stretchable tape in a sitting position with the leg bent 90° at the knee and manipulated to maintain close contact with the skin without compression of underlying tissues. Blood pressure was measured using electronic blood pressure monitor (OMRON® MXβ Basic, OMRON HEALTHCARE, INC. Bannockburn, Illinois 60015.CHINA).

Sample collection and biological assays

Blood samples (5 ml) were collected by venepuncture in a dry tube. The tube was centrifuged at 3000 RPM for 10 minutes and the serum obtained were used for albumin assay using Randox Compact Chemistry Analyser (RX Monaco plus).

Assessment of nutritional status

We used "The Mini Nutritional Assessment Short Form (MNA-SF)" and "the Global Leadership Initiative on Malnutrition Diagnostic (GLIM)" criteria for the assessment of nutritional status of the participants of this study.

The Mini Nutritional Assessment Short Form

The Mini Nutritional Assessment-Short form (MNA-SF) is an initial screening test for nutritional risk, and is considered as a gold standard for detection of undernutrition in geriatrics. It is one of the questionnaires recommended as a screening tool for malnutrition risk by the GLIM experts. The form contains six questions regarding decrease in food intake (1), weight loss (2), mobility (3), psychological distress or acute disease (4), neuropsychological problems (5), and body mass index (6). Using these criteria, a maximum of expected score is 14. a score of 12 or more indicate normal nutritional status, a score between 8 and 11 defines patients at risk of undernutrition while a score below 8 indicate undernourished patients.

The Global Leadership Initiative on Malnutrition

The GLIM criteria were developed in 2019 by the European Society for Clinical Nutrition and Metabolism (ESPEN), the American Society for Parenteral and Enteral Nutrition (ASPEN) and the Federation of Parenteral and Enteral Nutrition Society of Asia (PENSA). It consists of three phenotypic criteria and two etiologic criteria.

Phenotypic criteria

(1) Weight loss is acknowledged in persons with >5% loss within past 6 months, or >10% beyond 6 months.
(2) Low body mass index: <20 kg/m^2 if the patient is < 70 years or <22 kg/m^2 if < 70 years.
(3) Low muscle mass (LMM). Muscle mass is assessed based on the mid upper arm circumference. Mid upper arm circumference below 23 cm is considered as low muscle mass while those at 23 cm and above are considered as normal.

Etiologic criteria

(1) Reduced food intake is acknowledged in persons who declare at least moderate decrease in the number of meals or amount of food in the past three months;
(2) Disease burden/inflammatory condition is acknowledged if at least one chronic disease is present, associated with chronic or periodic inflammation (e.g., chronic obstructive pulmonary disease, chronic heart failure, or chronic kidney disease) or elevated C-reactive protein levels (>10 mg/L) are identified in the subjects' medical records.
Any participant with at least one phenotypic and one etiologic criterion was considered to be undernourished.

Data processing and analysis

Data were analyzed using the Statistical Package for Social Science (SPSS) version 26.0 (SPSS lnc, Chicago, IL, USA). The qualitative variables were expressed as numbers and percentages. Quantitative variables were expressed as mean with standard deviation or median with inter quartile range depending on their distribution. The comparison between qualitative variables was done using Chi-square test. Odds ratios were used to measure the association between qualitative variables. Data were considered statistically significant for a p-value < 0.05.

Ethical considerations

Ethical clearance was obtained from the Institutional Review Board of the Faculty of Health Sciences, University of Bamenda, Cameroon (2023/0798H/UBa/IRB). Before enrollment in the study, each participant provided a written informed consent.

RESULTS

Characteristic of the study population

Of the 146 participants included in this study, 46 (16.79%) were males, and 100 (83.21%) were females. The mean age was 67.2 ±7.0 years, with a minimum of 60 years and a maximum of 90 years. The most frequent comorbidities in our study population were hypertension (n=72, 49.3%) and obesity (n=42, 28.8 %) (Table 1). Concerning the clinical and biological characteristics of the study participants, their mean BMI and waist circumference were 28.0 ± 5.1 kg/m^2 and 97.6 ± 12.2 cm respectively whereas the mean fasting blood glucose and serum albumin were 183.3±76.6 mg/dl and 42.5 ± 4.3 g/l respectively (Table 2).

Table I. Socio-demographic characteristics and comorbidities in the study population		
Characteristics	**N**	**%**
Age range(years)		
<70	106	72.6
>70	40	27.4
Level of education		
None	16	10.9
Primary	70	47.94
Secondary	50	34.24
University	10	6.84
Marital status		
Married	120	82.19
Single	8	5.47
Divorced	2	1.36
Widowed	16	10.95
Comorbidities		
Hypertension	72	49.3
Obesity	42	28.8
Coronary artery disease	18	12.3
Dyslipidaemia	10	6.8

Prevalence of undernutrition in the study population

We used the Global Leadership Initiative on Malnutrition (GLIM) criteria and the Mini Nutritional Assessment Short Form (MNA-SF) to assess the nutritional status in the study participants. According to the MNA-SF, out of 146 participants enrolled in this study, 60 had normal nutritional status, 68 were at risk of undernutrition and 18 were undernourished. Thus, the prevalence of undernutrition was 12.3% in elderly patients with type 2 diabetes mellitus (Figure 1A). However, by using the GLIM criteria, 124 participants had a normal nutritional status while 22 were undernourished, giving a prevalence of undernutrition of 15.1% in elderly patients with type 2 diabetes mellitus (Figure 1B).

Table II. Clinical and biological characteristics of the study population			
Variables	**Mean ± SD**	**Min**	**Max**
BMI (kg/m2)	28.0 ± 5.1	17.19	42.38
WC (cm)	97.6 ± 12.2	70	122
SBP (mmHg)	133 ± 20.0	83	184
DBP (mmHg)	78.5 ± 12.6	51	115
FBG (g/l)	183.3 ± 76.6	78	404
Serum albumin (g/l)	42.5 ± 4.3	32.30	56.20

Min: Minimum, Max:Maximum, BMI: body mass index,WC: waist circumference, SBP: systolic blood pressure, DBP: diastolic blood pressure , FBG: fasting blood glucose

Clinical and biological presentation of undernutrition and factors associated with undernutrition in the study participants

A poor fasting blood glucose status, a normal body mass index, waist circumference, and serum albumin levels summarized the clinical and biological presentation of the undernourished participants. The waist circumference and the body mass index were lower in undernourished participants compared to participants with normal nutritional status and those at risk of undernutrition (91.1±11.1cm vs 98.4±5.0cm; p=0.02 and 24.0±3.6 kg/m^2 vs 28.6±5.0 kg/m^2; p<0.001 respectively).

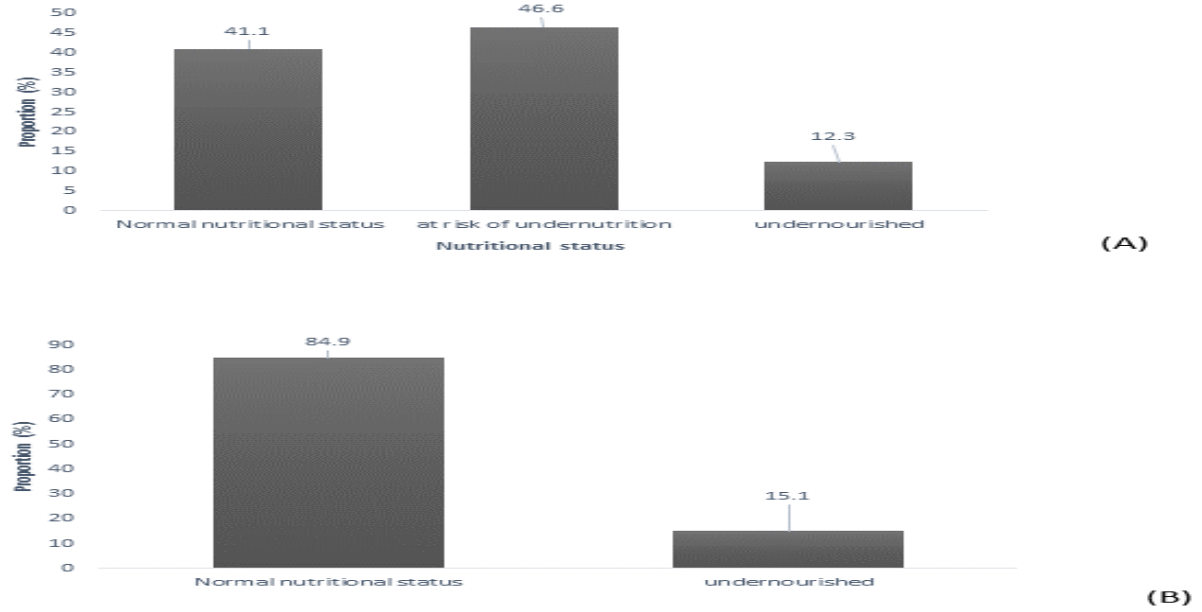

Figure 1. Prevalence of undernutrition in the study population according to MNA-SF (A) and GLIM criteria (B)

The undernourished participants had higher levels of fasting blood glucose compared to participants with normal nutritional status and at risk of undernutrition (236.0±105.8 mg/dl vs 175.9±68.9; p=0.002). Age and serum albumin levels were comparable between both groups (Table III).

Table III. Characteristics of study population according to the nutritional status

Variables	Normal nutritional statusat risk of undernutrition (N=128)	Undernourished (N=18)	p-value
Age (years)	66.9±7.1	69.4±5.7	0.14
WC (cm)	98.4 ±5.0	91.1±11.1	0.02
BMI (kg/m^2)	28.6±5.0	24.0±3.6	<0.001
FBG (mg/dl)	175.9±68.9	236.0±105.8	0.002
Serum albumin(g/l)	42.7±4.2	41.4±4.5	0.22

WC. Waist circumference, BMI: Body mass index, FBG: Fasting blood glucose

Table IV. Factors associated with undernutrition in the study population

Variables	Undernourished (N =18)	Normal nutritional status (N = 128)	OR (95% CI)	P-value
Age				
<70 years	8 (44.4)	98(76.6)	4.1(1.48-11.3)	0.004
>70 years	10(55.6)	30(23.4)		
Gender				
Male	6(33.3)	42(32.8)	1.02(0.41-2.55)	0.96
Female	12(66.7)	86(67.2)		
Education				
None	2(11.1)	14(10.9)	0.98(0.20-4.72)	0.98
Scolarised	16(88.9)	114(89.1)		
Duration DM				
<10 years	8(44.4)	66(51.6)	0.78(0.33-1.86)	0.57
>10 years	10(55.6)	62(48.4)		
Polypharmacy				
Yes	12(66.7)	42(32.8)	0.29(0.12-0.74)	0.005
No	6(33.3)	86(67.2)		

When considering the group of undernourished participants, there were twice more women as in men. Most of these participants were over 70 years old, with body mass index and serum albumin within the normal values. There was an association between age (OR: 4.1 [95%CI: 1.48-11.3], p=0.001), polypharmacy (OR: 0.29 [95%CI:0.12-0.74] p=0.005), and nutritional status while we did not find any association between gender and duration from the diagnosis of diabetes with undernutrition in this study (Table IV).

DISCUSSION

The aim of this study was to assess the nutritional status of elderly type 2 diabetes patients in a group of Cameroonians population. The prevalence of undernutrition in our study population was 12.3% according to the MNA-SF and 15.1% according to the GLIM criteria. A poor fasting blood glucose status, a normal body mass index, waist circumference, and serum albumin levels summarized the clinical and biological presentation of the undernourished participants. We also noticed an association between age (OR: 4.1 [95%CI: 1.48-11.3], p=0.001), polypharmacy (OR: 0.29[95%CI: 0.12-0.74], p=0.005), and the nutritional status. We used two independent scores to assess the prevalence of undernutrition in our study population. The prevalence of undernutrition in elderly patients with type 2 diabetes mellitus ranged from 12.3% to 15.1% according to the screening tools used (MNA-SF and GLIM respectively). This prevalence was similar to a study done by Tadesse *et al* in Ethiopia where the prevalence of undernutrition was 14.6%[14]. This can be explained by the fact that elderly patients with type 2 diabetes mellitus are exposed to complications such as autonomic neuropathy (malabsorption, diarrhea, gastroparesis) and diabetic kidney disease which may predispose them to undernutrition[15]. Likewise, the findings of our study demonstrated a higher prevalence of undernutrition among very old participants (55.6%), a finding that is also supported by studies that have reported higher prevalence rates of undernutrition in patients aged 70 years and above[14]. Poor fasting blood glucose status in the undernourished population can be explained by relative insulinopenia. Francis *et al*. in India reported that nutrient deficiency reduces beta cell function and volume thus exposing the undernourished patients to hyperglycemia and insulin resistance[16]. The poor glycaemic status also contributes to the negative energy balance, as the mean fasting blood glucose in elderly patients with type 2 diabetes mellitus was 236.0±105.8 mg/dl which is above 180 mg/dl the threshold for glucosuria. Every loss of 100 g of glucose in urine is equivalent to 400 kcal of energy lost. We also report some patients in a state of undernutrition who had normal body mass index values according to the WHO classification for BMI, thus indicating that body mass index alone is not the hallmark of undernutrition[11]. Patients aged 70 and above were four times more risk at risk of undernutrition compare to those below 70 years. Those who were not on polypharmacy were less at risk of undernutrition compare to the other. Polypharmacy can lead to undernutrition in several ways, first, the adverse effects of drugs, their action on the central nervous system and the digestive system to reduce appetite and absorption of nutrients[17]. A recent literature review by Young and Maguire in 2019, reported that several drug classes are implicated in drug-

nutrient interactions[18]. We encountered some limitations in this study. First, we did not evaluate cognitive impairment and the dependence level of these elderly patients. This would have given the role of geriatric factors in the occurrence of undernutrition. Secondly, there may be a selection bias given that we recruited elderly outpatients with diabetes. However, to the best of our knowledge, this is one the first studies that assessed the nutritional status of elderly patients with type 2 diabetes mellitus in Cameroon.

CONCLUSION

Knowledge Undernutrition affects more than 1/10 elderly outpatients with diabetes. The prevalence of undernutrition in elderly patients with type 2 diabetes mellitus ranged from 12.3% to 15.1% in the studied population. Compared to elderly patients with normal nutritional status, those with undernutrition had lower waist circumference, body mass index, and high fasting blood glucose but similar serum albumin levels. Age and polypharmacy were associated with undernutrition but not the duration of diabetes.

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Authors contribution

- Study design: Sobngwi E, Ongmeb Boli A, Tabi C
- Data collection: Tsala Owona C, Mambap A, Ndi Manga A
- Data analysis and draft writing: Feutseu C, Inna Astasselbe H, Ongmeb Boli A, Djeugoue P
- Manuscript review: All authors

Conflicts of interest

None

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