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Prevalence of malnutrition risk in elderly with type 2 diabetes mellitus

Abstract

Introduction: Type 2 diabetes is more common in the elderly and is associated with obesity. People with diabetes are already at risk of poor health because of the disease complications. Diabetic patients often have an obese appearance and malnutrition is often unrecognized and untreated.

Aim: The present study is to assess the prevalence of malnutrition risk in a sample of elderly people with type 2 diabetes.

Methodology: A cross-sectional observational study was carried out on 47 elderly diabetic patients. Clinical and anthropometric data (weight and height) were obtained by consulting clinical records. To archived sociodemographic and lifestyle information it was applied a questionnaire. Waist circumference (CP), arm (PB) and leg (PP) perimeters were measured were performed according to standard procedures. The body fat percentage (BF) was calculated from the anthropometric equation of Deurenberg (1998). The Mini Nutritional Assessment (MNA®), validated for the geriatric population was used to assessment nutritional risk. The statistical analysis of the data was performed using the computer software for Windows, SPSS®, version 25.0 (SPSS INc, Chicago). Statistical significance was considered when $p < 0.05$.

Results: The average age of the participants was 74.2±5.3 years with 53.2% males and 46.8% females. The mean value of HbA1c was 8.30±1.98%. There was no statistical significance (p=0.50) between the mean BMI of men (28.9±4.8) and women (30.0±5.7). According to the evaluation of Lipschitz (1994), 51.9% of men and 68.4% of women are overweight. Results of the nutritional status assessment according to the MNA® showed that 27.7% of diabetic patients were at risk of malnutrition.

Conclusion: The prevalence of the malnutrition risk in the present study is very relevant (27.7%), being crucial the nutritional monitoring of participants at nutritional risk and/or overweight, in order to avoid deterioration in their health status and promote a healthy lifestyle.

Keywords: elderly, malnutrition, diabetes mellitus, evaluation, nutritional status

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Introduction

Aging is a natural and proper process of human development, which submits the organism to several anatomical and functional changes, with repercussions on the health conditions and on the eating pattern of the elderly.[1] In Portugal, according to the latest projections from the National Statistics Institute (2017), there has been a worsening of demographic aging, where it is estimated that, between 2015 and 2080, the population aged 65 or over will be from 2.1 to 2.8 million people. This situation implies that greater attention is paid to this population group and that measures are taken to promote improvements in the life quality, reducing the impact that it may have on society in general. In this sense, the "National Strategy Plan for Active and Healthy Aging 2017-2025" stands out, which has been outlined by the Directorate-General for Health (DGS, 2017) based on the concept of Active Aging proposed in 2002 by the World Health Organization (WHO, 2002).

Malnutrition is a nutritional condition that arises with the decrease or increase in the consumption of energy, proteins and other nutrients, causing measurable adverse effects on body functions.[2] In the case of the elderly, the greater propensity for changes in nutritional status, namely malnutrition, which can cause or worsen the state of fragility, is discussed. This population group is more susceptible to malnutrition due to changes in taste and smell, difficulties in swallowing, oral/dental problems and functional deficiencies, which lead to difficulties in the preparation or consumption of food.[3] Thus, it is up to the nutrition professional to know the needs of this population, in order to avoid that an inadequate nutritional status contributes to an increase in physical disability, morbidity, mortality and decreased life quality.[4]

Changes in body composition, as part of the aging process are, namely, decreased fat-free mass, increased fat mass, visceral obesity[5] and sarcopenia. This condition, which is characterized by a decrease in muscle mass, represents an increased risk of falls and fractures and its prevalence derives from several factors, including an inadequate diet and a sedentary lifestyle.[6] Sarcopenia increases the risk of developing chronic diseases, such as cardiovascular disease, hypertension and diabetes mellitus (DM).[7] With regard to DM, it is a disease that is characterized by chronic hyperglycemia and is associated with macro and microvascular complications.[8] Glycated hemoglobin (HbA1c) is an important parameter in monitoring glycemic control, as it reflects the average glycemia over the previous 120 days and has a strong predictive value for complications of DM.[9]

The prevalence rate of diabetes in the elderly is generally high[7] and, according to the National Diabetes Observatory (2016), the progressive aging of the Portuguese population was reflected in a strong increase in diabetes with age, being that more than 1/4 of people aged 60-79 have the disease. Type 2 diabetes (T2DM) appears with increasing age and has a strong link with obesity and, in this sense, these patients tend to have an obese appearance,[2] underestimating the risk of malnutrition. In the elderly, this health condition increases the risk of hospitalizations, home isolation and physical disability that substantially impair life quality,[10] recognizing the importance of nutritional education in the improvement of metabolic control of these patients.[11]

The assessment of nutritional status in the elderly is essential to early detect nutritional imbalances and enable an appropriate intervention to address physiological needs. In diabetes, nutrition status evaluation is important to cardiovascular to prevent and control the progression of complications or to prevent deterioration of health. The Mini Nutritional Assessment® (MNA) is one of the few validated questionnaires and the most used in the elderly to assess the risk of malnutrition or malnutrition, being easy and quick to apply and reproducible.[12] Due to the increase in demographic aging, as well as the increase in the prevalence of diabetes, there is the importance of monitoring changes in the nutritional status of this population to ensure health and well-being. The aim of the present study is to assess the prevalence of malnutrition risk in a sample of elderly people with type 2 diabetes.

Methodology

Study design

A cross-sectional observational study was carried out on 47 elderly diabetic patients recruted at Portuguese Diabetes Association (APDP). The following inclusion criteria were defined:

a) Presence of diabetes diagnosed according to the American Diabetes Association (ADA) criteria

b) Age equal to or above 65 years

c) Attending a first-time or follow-up nutrition consultation

d) Digned informed consent.

Ethical considerations

The study was previously approved by the APDP Health Ethics Committee. The work was developed according to the considerations contained in the Helsinki Declaration.[13] All the participants received detailed project information and were informed that they could refuse participation or withdraw at any time. Finally, each participant signed the informed consent.

Data collection

Clinical and anthropometric data (weight and height) were obtained by consulting clinical records of participants at APDP. To achieved sociodemographic and lifestyle information it was applied a questionnaire. Lipschitz[14] was used as reference to evaluate subjects nutritional status. Waist circumference (CP) were compared with WHO[15] reference values. The arm (PB) and leg (PP) perimeters were measured using an anthropometric tape of Cescorf brand (model Trena), with a precision of 1mm. These measurements were performed according to standard procedures.[16] The body fat (BF) percentage was calculated from the anthropometric equation of Deurenberg (1998): [% BF=1.29 (BMI)+0.20 (I) - (11.4 x gender*)-8)], which estimates BF based on BMI, age and gender* (male=1; female=0).[17] Results were compared with the reference values defined by the WHO.[18]

Nutritional risk assessment: The MNA®, validated for the geriatric population was used to assessment nutritional risk. This tool has 18 questions and, it is divided in two sections: screening and global assessment. The screening part includes 6 questions, related to food intake and weight loss in the last three months, mobility, psychological stress, neurological problems and BMI. If the score obtained in the screening section is equal or less than 11, the questionnaire is continued to be filled in to the global assessment section. The second section consists of 12 questions regarding the place of residence, the use of medicines, the existence of skin lesions, the number of daily meals and portions, fluid intake, the way of eating, self-perception of own health and nutritional status. Each question has a score, which contributes to the final result of the questionnaire, with a maximum score of 30 points. Values equal to or greater than 24 indicate an adequate nutritional status; values between 17 and 23.5 the individual is considered at risk of nutrition and values below 17 indicate malnutrition (Vellas et al, 2006).

Statistical analysis: The statistical analysis of the data was performed using the computer software for Windows, SPSS®, version 25.0 (SPSS INc, Chicago). The results were expressed as mean±standard deviation (SD) or as number and percentage. The normality of all variables was tested using the Shapiro-Wilk test ($n < 50$). The t-student test was applied to compare means of numerical variables with normal distribution. Statistical significance was considered when $p<0.05$.

Results

General characterization of the study sample

The general characteristics of the sample are described in Table 1. The average age of the participants was 74.2±5.3years with 53.2% males and 46.8% females. The mean value of HbA1c was 8.30±1.98%, higher than the ADA recommendation (HbA1c≤7%) (Meneilly et al., 2018).[19] The results show that the majority of elderly do not practice physical activity (62%). The evaluation of participants lipid profile were: Total Cholesterol (TC) (171.7±48.1mmol/L) Cholesterol HDL (46.3±12.8mmol/L), Cholesterol LDL (112.7±32.0mmol/L) and Triglycerides (182.6±126mmol/L). Some values were above (e.g. Triglycerides) the recommendations of the European Society of Cardiology (2018). With regard to the prevalence of complications, about 15% of the participants had retinopathy, followed by peripheral vascular disease (14.6%) and nephrological complications (12.4%).

Nutritional assessment

Anthropometry and body composition: The results of anthropometric measurements and body composition, by sex, are described in Table 2. There was no statistical significance ($p=0.50$) between the mean BMI of men (28.9±4.8) and women (30.0±5.7). The results of the BMI categorization according to the Lipschitz classification,[14] showed that the prevalence of overweight was more frequent in female participants (68.4%). There were statistically significant differences ($p=0.019$) between the averages of the weights of male (82.1±15.4) and female (71.7±13.3) participants and in body fat percentage ($p<0.001$). The results of the evaluation of the prevalence of abdominal obesity, obtained based on the waist circumference and according to the appropriate cutoff points for its diagnosis, defined by the World Health Organization, showed that 80% of women and about 52% of men have abdominal obesity of this type, therefore greater cardiovascular risk.[20]

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Table 1 General characteristics of the sample under study

Characteristics	Elderly people with diabetes (n=47)
Age years	74.2±5.3
Sex	
Male	27 (57.4)
Female	20 (42.6)
Type of consultation	
First time	18 (38.3)
Follow-up	29 (61.7)
Years of evolution of Diabetes	16.6±12.1
HbA1c (%)	8.30±1.98
Physical activity	
Practice	17 (36.2)
Don't practice	30 (63.8)
Lipid profile	
TC (mmol/L)	171.7±48.1
C-HDL (mmol/L)	46.3±12.8
C-LDL (mmol/L)	112.7±32.0
Triglycerides (mmol/L)	182.6±126.0
Prevalence of complications	
Ophthalmology	9 (15.0)
Podological	3 (7.8)
Neurological	3 (4.2)
Neurological	5 (9.3)
Cardiological	7 (12.4)
DVP	5 (14.6)

The results are expressed as number of individuals (percentage) or mean ± standard deviation

HbA1c, glycated hemoglobin; TC, total cholesterol; C-HDL, cholesterol from high plasma density lipoproteins; LDL-C, low plasma density lipoprotein cholesterol

Table 2 Evaluation of anthropometric parameters and body composition in the sample

Anthropometric parameters	Male (n=27)	Female (n=20)	p-value
Age (years)	74.6±5.4	73.8±5.4	
BMI (kg /m2)	28.9±4.8	30.0±5.7	0.5
Malnutrition (<22Kg /m2)	1(3.7)	1(5.3)	
Weight (22-27Kg/m2)	12(44.4)	5(26.3)	
Excess weight (> 27 kg/m2)	14(51.9)	13(68.4)	
Weight (kg)	82.1±15.4	71.7±13.3	0.019
Height (m)	1.70±0.1	1.60±0.1	<0.001
Arm circumference (cm)	31.5±3.6	31.2±4.7	0.833
Leg circumference (cm)	37.0±4.0	35.3±3.9	0.156
Waist circumference (cm)	103±10.4	97.7±12.4	0.093
Body Fat (%)	32.8±6.1	45.4±7.7	<0.001
Very higha	25 (92.6)	18 (94.7)	

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Table Continued...

Anthropometric parameters	Male (n=27)	Female (n=20)	p-value
Abdominal obesityb			
Normal	4 (14.8)	1 (5.0)	
High risk	9 (33.3)	3 (15.0)	
Very high risk	14 (51.9)	16 (80)	

Results expressed as number of individuals (percentage) or average standard deviation. BMI, body mass index

[a]BF percentage very high:>25 in men and >35 in women

[b]Abdominal obesity was defined as having a high risk waist circumference ≥94cm in men and ≥80 in women and a very high risk ≥102cm in men and ≥88 in women

Assessment of nutritional status: Tables 3 and Table 4 show the results of the MNA® application to the elderly sample. Around of 26% of the participants had moderate decrease of food intake. Regarding weight loss in the last 3 months, 59.6% reported not having lost weight, 21.3% found a loss between 1 and 3kg and 14.9% a loss greater than 3kg. According to the global assessment of the MNA® presented in Table 4 (questions from G to R), it was found that 98% of the subjects eats the 3 main meals daily, 57% indicate that eat at least one daily serving of milk or dairy products, 2 or more servings of legumes or eggs per week and meat, fish or poultry every day. With regard to the consumption of fruits and vegetables, 98% of participants reported consuming more than 2 servings per day. As for fluid intake, 23% responded that drink 3 to 5 glasses of liquids and 70% more than 5 glasses a day. In relation to arm perimeter, values >22cm were obtained for 47 participants and for leg perimeter values ≥31cm were obtained in 45 subjects. Table 5 presents the results of the general classification of the assessment of nutritional status according to the MNA®. The results revealed that 72.3% of the individuals had a normal nutritional status and 27.7% were at risk of malnutrition.

Table 3 Characterization of the Mini Nutritional Assessment® screening

Screening Questions	Answer	n (%)
A - Decrease in food intake due to loss of appetite	0	2(4)
	1	12(26)
	2	33(70)
B - Weight loss	0	7(14.8)
	1	2(4.3)
	2	10(21.3)
	3	28(59.6)
C - Mobility	0	0(0.0)
	1	2(4.3)
	2	45(95.7)
D - Psychological stress or acute illness	0	14(30)
	2	33(70)
E - Neuropsychological problems	0	4(9)
	1	0(0)
	2	43(91)
F - Body Mass Index (BMI)	0	0(0)
	1	1(2.2)
	2	2(4.3)
	3	43(93.5)

The results are expressed as number of individuals (percentage)

Table 4 Global assessment of the Mini Nutritional Assessment®

Global Assessment Questions	Answer	n (%)
G-You live in your own home?	1	42(89)
	0	5(11)
H-Take more than 3 different drugs/day	0	43(91)
	1	4(9.0)
I-Has skin lesions or bedsores	0	7(15)
	1	40(85)
J-Number of complete meals/day	0	0(0.0)
	1	1(2.0)
	2	46(98)
K-Portions of milk and dairy products; legumes or eggs; meat, fish or poultry	0	6(13)
	0.5	14(30)
	1	27(57)
L-Consume per day ≥ 2 servings of fruit / vegetables	0	1(2.0)
	1	46(98)
M-How many cups of liquid (water, juice, coffee, milk, tea) you consume per day	0	3(6.0)
	0.5	11(23)
	1	33(70)
N-Feeding mode	0	0(0.0)
	1	0(0.0)
	2	47(100)
O-Do you think you have any nutritional problem	0	2(4.25)
	1	2(4.25)
	2	43(91.5)
P-In comparison with others, how do you classify your own health?	0	5(11)
	0.5	7(15)
	1	12(26)
	2	23(49)
Q-Arm circumference	0	0(0.00)
	0.5	0(0.00)
	1	47(100)
R-Leg circumference	0	2(4.0)
	1	45(96)

The results are expressed as number of individuals (percentage)

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Table 5 General classification of nutritional status according to the Mini Nutritional Assessment®

Nutritional status	Sample evaluation (n=47)
Malnutrition (<17 points)	0.0 (0.00)
At risk of malnutrition (from 17 to 23.5 points)	13 (27.7)
Normal nutritional status (24 to 30 points)	34 (72.3)

The results are expressed as number of individuals (percentage)

Discussion

The increase in average life expectancy makes it important to study the relationship between nutrition and aging.[17] Inadequate nutrition can lead to malnutrition. In the present study, the participants had DMT2, a type of diabetes associated with age.[7] According to the BMI results, it was found that most participants were overweight. This is a characteristic widely observed in individuals with diabetes, since the proportion of body fat increases with age, affecting health status.[21] The results released by the Diabetes Observatory (Portuguese Society of Diabetology, 2016), showed that there is a strong association between BMI and diabetes, with 90% of the population with diabetes presenting pre-obesity (49.2%) or obesity (39.6%). However, BMI may not be an accurate predictor of the adiposity degree in some elderly people due to changes in body composition with aging (Kirkman et al., 2012). The evaluation of abdominal obesity in the elderly seems to have a greater prognostic value than the BMI isolated, with abdominal obesity being also a factor associated to insulin resistance.[21] Individuals with diabetes may have a greater tendency towards obesity, but they are also susceptible to a greater risk of malnutrition, when compared to individuals without diabetes (Cobo et al., 2016), and hypoglycemic medication may increase this risk.[22] The average value of HbA1c in the sample was 8.30%, which is a higher value than that recommended by the ADA.[19] Yet, as all participants are elderly, the design of glycemic goals must take into account other factors, such as the coexistence of other pathologies, life expectancy and the risk of hypoglycemia, for a better risk/benefit ratio (Kirkman et al., 2012). In this study, 27.7% of the elderly were assessed as being at risk of malnutrition. This prevalence is much higher than the observed in another cross-sectional observational study carried out in Portuguese elderly people without Diabetes, with 16.7% being at risk of malnutrition (Lage et al., 2018). In the present study, the elderly are domiciled and have multidisciplinary follow-up, including nutrition. Deference between the two studies may be associated with the fact that they are diabetic and are under medical treatment, which can affect their nutritional status. In another study conducted on 385 elderly users enrolled at the Health Center of Santa Maria de Bragança, a prevalence of 24.2% of elderly people at risk of malnutrition and 0.8% in malnourished state was observed.[23] The present study had some limitations, namely the time for data collection and the sample size. In the future it will be important to carry out more studies with a larger sample size in order to increase scientific evidence on the prevalence of nutritional risk in non-institutionalized elderly.[24,25]

Conclusion

Malnutrition in the elderly is most often devalued and its diagnosis requires specific screening tools, as well as awareness of health professionals and adequate training. The prevalence of malnutrition risk in the present study is very relevant (27.7%), being essential the nutritional monitoring of participants at nutritional risk and/or overweight, in order to avoid deterioration in their health status and promote a healthy lifestyle. This study highlights the need for personalized nutritional intervention in the context of secondary health care, through nutritional monitoring by a health professional specialized in food and nutrition in the elderly with diabetes mellitus.

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Conflicts of interest

The authors declare that they have no competing interests.

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