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Article

Assessment of nutritional status in elderly individuals with diabetes mellitus

Avaliação do estado nutricional em idosos com diabetes mellitus

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ABSTRACT: *Objective*: To analyze the nutritional status of elderly individuals with diabetes mellitus. *Methods*: Cross-sectional population-based study. Part of the Longitudinal Study of Health of the Elderly of Alcobaça – ELSIA, including 465 elderly people. Data analysis was performed using a structured questionnaire containing sociodemographic, health and behavioral information. Nutritional status was assessed using the Mini Nutritional Assessment – MNA. *Results:* There was a prevalence of risk of malnutrition/malnutrition of 47,1% (15,7% in men and 30,1% in women) in the group with diabetes. The MNA analysis revealed that the individuals in the group with diabetes, when compared to the group without diabetes, presented greater weight loss in the last three months (p=0,017), took more than three different medications per day (p=≤0,0001), believed they were malnourished (p=0,003) and considered their own health as not very good (p=0,027). When comparing genders, the male diabetes group showed differences in relation to the use of multiple medications (p=≤0,0001), mobility (p=≤0,0001), and neuropsychological problems (p=0,029). While females showed a statistically significant difference in relation to use of multiple medications (p=≤0,0001). *Conclusion:* The findings showed a significant prevalence of risk of malnutrition/malnutrition in elderly with diabetes mellitus, especially in females. However, the presence of the disease in males has been shown to have a significant impact on nutritional status when analyzing MNA parameters.

KEY WORDS: Diabetes mellitus; Elderly; Nutritional status; Malnutrition.

RESUMO: *Objetivo:* Analisar o estado nutricional de idosos com diabetes mellitus. *Método*: Estudo transversal de base populacional. Parte integrante do Estudo Longitudinal de Saúde do Idoso de Alcobaça – ELSIA, incluindo 465 idosos. A análise de dados foi realizada por meio de um questionário estruturado contendo informações sociodemográficas, saúde e comportamentais. O estado nutricional foi avaliado por meio da Mini Avaliação Nutricional – MAN. *Resultados*: Observou-se prevalência de risco de desnutrição/desnutrição de 47,1% (15,7% nos homens e 30,1% nas mulheres) no grupo com diabetes. A análise da MAN revelou que os indivíduos do grupo com diabetes quando comparados ao sem diabetes, apresentaram maiores perdas de peso nos últimos três meses (p=0,017), utilizavam mais de três medicamentos por dia (p=≤0,0001), acreditavam estar desnutridos (p=0,003) e consideravam a própria saúde como não muito boa (p=0,027). Ao comparar os sexos, o grupo com diabetes do sexo masculino apresentou diferenças em relação ao uso de múltiplos medicamentos (p=≤0,0001), mobilidade (p=≤0,0001), e problemas neuropsicológicos (p=0,029). Enquanto o sexo feminino apresentou diferença estatisticamente significativa em relação a utilização de múltiplos medicamentos (p=≤0,0001). *Conclusão***:** Os achados evidenciam uma prevalência significativa de risco de desnutrição/desnutrição em idosos diabéticos, principalmente no sexo feminino. Porém, a presença da doença no sexo masculino demonstrou ter impacto significativo no estado nutricional ao analisar os parâmetros da MAN.

PALAVRAS-CHAVE: Diabetes mellitus; Idosos; Estado nutricional; Desnutrição.

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INTRODUCTION

Life expectancy has increased significantly over the last century[1]. The aging process is natural, physiological and biological, physical, social and psychological changes occur, which can lead to a decrease in the functional performance of various organs and systems and affect resilience to cognitive, mental and stress factors[2,3]. Due to these changes, there is a risk of developing various diseases[4]. Among the chronic diseases that most affect the older adult population is diabetes mellitus[5].

Diabetes mellitus is recognized worldwide as a serious public health problem[6]. It is estimated that the older adult population with diabetes will increase from 122 million to 253 million between 2017 and 2045[7].

Given its chronic degenerative nature, diabetes has been associated with frailty in the older adult, affecting their daily activities[8]. It also contributes to the onset of various geriatric conditions, such as cognitive impairment and involuntary weight loss[9]. Because of the multiple morbidities and possible functional limitations that can arise during the course of the disease, older adult with diabetes is at risk of developing malnutrition[10].

Considering the growing number of older adults with diabetes and the impact the disease can have on nutritional status, detecting the risk of malnutrition in older adult diabetics is of paramount importance to prevent acute or chronic complications and ensure quality of life. Given this context, the study aimed to analyze the nutritional status of older adult people with diabetes mellitus.

METHOD

This cross-sectional, population-based study is part of the "Longitudinal Study of the Health of the Elderly in Alcobaça (ELSIA - Brazil)", approved by the Human Research Ethics Committee of the Federal University of the Triângulo Mineiro.

The study was carried out in the community of Alcobaça, in the state of Bahia, with all individuals who lived in the urban area and were aged 60 or over. In May 2015, a total of 743 older adult people were registered with the Family Health Strategy and were invited, of whom 473 took part in the study. Individuals who were bedridden, hospitalized, living in long-term care institutions, those with severe visual and hearing impairment, wheelchair users, with ≤ 12 points on the Mini Mental State Examination[11] regardless of their level of education and those diagnosed with illnesses that prevented them from taking part in the interview were excluded.

All the individuals signed an informed consent form and, in their own homes, answered a structured questionnaire containing sociodemographic, health and behavioral information. The home interviews were carried out by duly trained health professionals and academics from UFTM and UNEB, with the help of Community Health Workers from the Municipality of Alcobaça, between July and October 2015.

The variables analyzed in this study were: gender (male; female), age group (60 to 69; ≥ 70 years), self-reported diabetes mellitus (yes; no).

Weight, height and arm and calf circumferences were measured by anthropometrics previously trained by a single nutritionist supervisor.

Nutritional status was assessed using the Mini Nutritional Assessment (MNA)[12]. The MNA comprises 18 questions grouped into five sections: 1) anthropometric (weight, height, weight loss, arm and calf circumference); 2) health (weight loss in recent months, use of medication, mobility, presence of skin lesions or bedsores, neurological problems, occurrence of stress / acute illness in recent months); 3) diet (number of meals, food intake, fluid consumption, way of eating); 4) self-assessment (perception of health and nutritional status, food intake); 5) type of housing.

Each answer was given a value, which was added up to make a final score. A total score ≥24 indicated eutrophy, from 17 to 23.5 risk of malnutrition and <17 malnutrition.

Nutritional status was analyzed as follows: normal nutritional status (MNA score ≥24) and risk of malnutrition/ malnutrition (MNA score <23).

The frequency (absolute and relative) was calculated to obtain the prevalence of nutritional status and diabetes mellitus overall and by gender. The chi-square test was used to assess the differences between nutritional status and diabetes mellitus in general and by gender according to parameters assessed by the MNA (anthropometric, health, dietary, self-assessment and type of housing). A p-value of <0.05 was considered significant. The statistical analysis calculations were carried out using the SPSS program for Windows (SPSS Software, Version 20.0. SPSS Inc. Woking, Surrey, UK).

RESULTS

Of the 465 older adult analyzed, 62.8% (n=292) were female and 37.2% (n=173) male, with 57.9% (n=169) and 50.3% (n=87) aged between 60 and 69 and 42.1% (n=123) and 49.7% (n=86) aged over 70, respectively. The prevalence of diabetes in the study population was 19.1% (n=89).

When analyzing the nutritional status of the older adult with diabetes, it was observed that the risk of malnutrition was 47.1% (n=42). Table 1 shows the prevalence of the nutritional status of the older adult, by gender, according to the presence of diabetes. There were statistically significant differences in the nutritional status of females, with a higher prevalence of risk of malnutrition/malnutrition in the group with diabetes (p=0.015).

Table 1 - Prevalence (%) of nutritional status of older adult people according to gender and presence of diabetes.

	Male			Female		
	Non-diabetes group n (%)	**Diabetes group n (%)**	***P***	**Non-diabetes group n (%)**	**Diabetes group n (%)**	***p***
Nutritional status						
Normal	107 (87.7)	15 (12.3)		147 (82.1)	32 (17.9)	
Risk of malnutrition/ malnutrition	43 (84.3)	8 (15.7)	0.549	79 (69.9)	34 (30.1)	**0.015***

* Pearson's chi-square p≤0,05.

Table 2 shows the MNA parameters assessed according to the presence of DM. When analyzing the health parameters, the group with diabetes showed greater weight loss in the last three months (between one kilo and more than three kilos and more than three kilos), 39.3% compared to 26.9% of the group without diabetes (p=0.017). As for the use of medication, 64.0% of the group with diabetes and 22.9% of the group without diabetes used more than three different medications a day (p=≤0.0001).

In the analysis of self-rated health parameters, there were significant differences between the group with diabetes and the group without diabetes. It was observed that 6.7% of the group with diabetes believed they were malnourished compared to 4.3% of the group without diabetes (p=0.003). In addition, 19.1% of the group with diabetes considered their own health to be not very good compared to 10.1% of the group without diabetes (p=0.027).

Table 2 - Number and percentage of older adult people according to parameters assessed by the Mini Nutritional Assessment according to the presence of diabetes mellitus.

Variables	Non-diabetes group n (%)	Diabetes group n (%)	*P*
Anthropometric			
Body mass index			
<19 kg/m²	13 (3.5)	3 (3.4)	
≤19<21 kg/m²	25 (6.6)	4 (4.5)	
≤21<23 kg/m²	44 (11.7)	6 (6.7)	0.448
≥23 kg/m²	294 (78.2)	76 (85.4)	
Arm circumference			
<21 cm	6 (1.6)	1 (1.1)	
21≤22 cm	5 (1.3)	0 (0.0)	0.518
>22 cm	365 (97.1)	88 (98.9)	
Calf circumference			
<31 cm	45 (12.0)	17 (19.1)	
≥31 cm	331 (88.0)	72 (80.9)	0.075
Health			
Weight loss in the last three months			
No weight loss	234 (62.2)	39 (43.8)	
Didn't know	41 (10.9)	15 (16.9)	
Between 1-3 kg	57 (15.2)	19 (21.3)	**0.017***
Over 3 kg	44 (11.7)	16 (18.0)	
Use more than three different medicines a day			
Yes	86 (22.9)	57 (64.0)	
No	290 (77.1)	32 (36.0)	**≤0.0001***
Mobility			
Normal	365 (97.1)	83 (93.3)	0.085
Wanders, but is unable to leave the house	11 (2.9)	6 (6.7)	
Skin lesions or bedsores			
Yes	26 (6.9)	9 (10.1)	0.304
No	350 (93.1)	80 (89.9)	
Neuropsychological problems			
No problems	361 (96.0)	82 (92.1)	
Mild dementia	11 (2.9)	5 (5.6)	0.300
Dementia or severe depression	4 (1.1)	2 (2.2)	
Psychological stress or acute illness in the last three months			
Yes	75 (19.9)	23 (25.8)	0.220
No	301 (80.1)	66 (74.2)	
Lives in own home/family			
Yes	369 (98.1)	89 (100.0)	0.195
No	7 (1.9)	0 (0.0)	
Food			
Meals a day			
One meal	10 (2.7)	1 (1.1)	
Two meals	96 (25.5)	20 (22.5)	0.550
Three meals	270 (71.8)	68 (76.4)	
At least one portion of milk or dairy products a day			
Yes	220 (58.5)	48 (53.9)	0.432
No	156 (41.5)	41 (46.1)	

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Variables	Non-diabetes group n (%)	Diabetes group n (%)	*P*
Two or more weekly portions of legumes or eggs			
Yes	345 (91.8)	83 (93.3)	0.638
No	31 (8.2)	6 (6.7)	
Meat, fish or poultry every day			
Yes	363 (96.5)	86 (96.6)	0.968
No	13 (3.5)	3 (3.4)	
Two or more portions of fruit or vegetables a day			
Yes	214 (56.9)	59 (66.3)	0.106
No	162 (43.1)	30 (33.7)	
A glass of liquid a day			
Less than 3 glasses	17 (4.5)	3 (3.4)	0.413
3-5 glasses	94 (25)	17 (19.1)	
More than 5 glasses	265 (70.5)	69 (77.5)	
How to eat			
Unable to feed themselves	2 (0.5)	1 (1.1)	0.784
Feeds himself with difficulty	3 (0.8)	1 (1.1)	
Feeds himself without difficulty	371 (98.7)	87 (97.8)	
Self-evaluation			
Decreased food intake			
Severe decrease	22 (5.9)	10 (11.2)	0.146
Moderate decrease	67 (17.8)	18 (20.2)	
No decrease	287 (76.3)	61 (68.5)	
Believes they have a nutritional problem			
Believes they are malnourished	16 (4.3)	6 (6.7)	**0.003***
Cannot say	19 (5.1)	13 (14.6)	
Believes not to have a nutritional problem	341 (90.7)	70 (78.7)	
How do you rate your own health?			
Not very good	38 (10.1)	17 (19.1)	**0.027***
Can't say	22 (5.9)	7 (7.9)	
Good	176 (46.9)	44 (49.4)	
Better	139 (37.1)	21 (23.6)	

*Pearson's chi-square p≤0,05.

Table 3 shows the analysis of the parameters assessed by the man according to the presence of DM by gender. In males, statistically significant differences between the groups with diabetes and without diabetes were observed in the following health parameters: use of more than three different medications per day (p=≤0.0001), mobility - walking but unable to leave the house (p=≤0.0001) and presence of mild dementia, dementia or severe depression (p=0.029). As for females, significant differences were seen only in the use of more than three different medications per day (p=≤0.0001).

With regard to the self-assessment category, only males showed significant differences between the groups. With regard to the variable "do you believe you have a nutritional problem", 13.0% of the group with diabetes believed they were malnourished, compared to 4.7% of the group without diabetes (p=<0.002).

Table 3 - Number and percentage of older adult according to parameters assessed by the Mini Nutritional Assessment according to the presence of diabetes mellitus by gender.

	Men			Women		
Variables	**Non-diabetes group n (%)**	**Diabetes group n (%)**	***P***	**Non-diabetes group n (%)**	**Diabetes group n (%)**	***p***
Anthropometric						
Body mass index						
<19 kg/m²	5 (3.3)	1 (4.3)	0.236	8 (3.5)	2 (3.0)	0.990
≤19<21 kg/m²	13 (8.7)	0 (0.0)		12 (5.3)	4 (6.1)	
≤21<23 kg/m²	29 (19.3)	2 (8.7)		15 (6.6)	4 (6.1)	
≥23 kg/m²	103 (68.7)	20 (87.0)		191 (84.5)	56 (84.8)	

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Variables	Men			Women		
	Non-diabetes group n (%)	Diabetes group n (%)	*P*	Non-diabetes group n (%)	Diabetes group n (%)	*p*
Arm circumference						
<21 cm	2 (1.3)	1 (4.3)		4 (1.8)	0 (0.0)	
21≤22 cm	3 (2.0)	0 (0.0)	0.471	2 (0.9)	0 (0.0)	0.409
>22 cm	145 (96.7)	22 (95.7)		220 (97.3)	66 (100.0)	
Calf circumference						
<31 cm	14 (9.3)	3 (13.0)	0.578	31 (13.7)	14 (21.2)	0.138
≥31 cm	136 (90.7)	20 (87.0)		195 (86.3)	52 (78.8)	
Health						
Weight loss in the last three months						
No weight loss	100 (66.7)	10 (43.5)		134 (59.3)	29 (43.9)	
Didn't know	13 (8.7)	4 (17.4)	0.088	28 (12.4)	11 (16.7)	0.157
Between 1-3 kg	24 (16.0)	4 (17.4)		33 (14.6)	15 (22.7)	
Over 3 kg	13 (8.7)	5 (21.7)		31 (13.7)	11 (16.7)	
Use more than three different medications a day						
Yes	23 (15.3)	13 (56.5)	**≤0.0001***	63 (27.9)	44 (66.7)	**≤0.0001***
No	127 (84.7)	10 (43.5)		163 (72.1)	22 (33.3)	
Mobility						
Normal	147 (98.0)	19 (82.6)	**≤0.0001***	218 (96.5)	64 (97.0)	0.841
Wanders, but is unable to leave the house	3 (2.0)	4 (17.4)		8 (3.5)	2 (3.0)	
Skin lesions or bedsores						
Yes	11 (7.3)	2 (8.7)	0.817	15 (6.6)	7 (10.6)	0.283
No	139 (92.7)	21 (91.3)		211 (93.4)	59 (89.4)	
Neuropsychological problems						
No problem	147 (98.0)	21 (91.3)		214 (94.7)	61 (92.4)	
Mild dementia	3 (2.0)	1 (4.3)	**0.029***	8 (3.5)	4 (6.1)	0.658
Dementia or severe depression	0 (0.0)	1 (4.3)		4 (1.8)	1 (1.5)	
Psychological stress or acute illness in the last three months						
Yes	23 (15.3)	3 (13.0)	0.775	52 (23.0)	20 (30.3)	0.226
No	127 (84.7)	20 (87.0)		174 (77.0)	46 (69.7)	
Lives in their own home/ Family						
Yes	148 (98.7)	23 (100.0)	0.578	221 (97.8)	66 (100.0)	0.223
No	2 (1.3)	0 (0.0)		5 (2.2)	0 (0.0)	
Food						
Meals a day						
One meal	1 (0.7)	1 (4.3)		9 (4.0)	0 (0.0)	
Two meals	42 (28.0)	5 (21.7)	0.267	54 (23.9)	15 (22.7)	0.241
Three meals	107 (71.3)	17 (73.9)		163 (72.1)	51 (77.3)	
At least one portion of milk or dairy products a day						
Yes	80 (53.3)	11 (47.8)	0.622	140 (61.9)	37 (56.1)	0.389
No	70 (46.7)	12 (52.2)		86 (38.1)	29 (43.9)	
Two or more servings of legumes a week or eggs						
Yes	140 (93.3)	22 (95.7)	0.671	205 (90.7)	61 (92.4)	0.667
No	10 (6.7)	1 (4.3)		21 (9.3)	5 (7.6)	

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Variables	Men			Women		
	Non-diabetes group n (%)	Diabetes group n (%)	*P*	Non-diabetes group n (%)	Diabetes group n (%)	*p*
Meat, fish or poultry every day						
Yes	146 (97.3)	23 (100.0)	0.428	217 (96.0)	63 (95.5)	0.839
No	4 (2.7)	0 (0.0)		9 (4.0)	3 (4.5)	
Two or more portions of fruit or vegetables a day						
Yes	72 (48.0)	16 (69.6)	0.054	142 (62.8)	43 (65.2)	0.731
No	78 (52.0)	7 (30.4)		84 (37.2)	23 (34.8)	
A glass of liquid a day						
Less than 3 glasses	5 (3.3)	1 (4.3)	0.967	12 (5.3)	2 (3.0)	0.244
3-5 glasses	34 (22.7)	5 (21.7)		60 (26.5)	12 (18.2)	
More than 5 glasses	111 (74.0)	17 (73.9)		154 (68.1)	52 (78.8)	
How to eat						
Unable to feed themselves	2 (1.3)	0 (0.0)	0.731	0 (0.0)	1 (1.5)	0.116
Feeds himself with difficulty	2 (1.3)	0 (0.0)		1 (0.4)	1 (1.5)	
Feeds himself without difficulty	146 (97.3)	23 (100.0)		225 (99.6)	64 (97.0)	
Self-evaluation						
Decreased food intake						
Severe decrease	5 (3.3)	1 (4.3)	0.909	17 (7.5)	9 (13.6)	0.275
Moderate decrease	22 (14.7)	4 (17.4)		45 (19.9)	14 (21.2)	
No decrease	123 (82.0)	18 (78.3)		164 (72.6)	43 (65.2)	
Do you believe you have a nutritional problem						
Believes he/she is malnourished	7 (4.7)	3 (13.0)	**0.002***	9 (4.0)	3 (4.5)	0.181
Cannot say	4 (2.7)	4 (17.4)		15 (6.6)	9 (13.6)	
Believes not to have a nutritional problem	139 (92.6)	16 (69.6)		202 (89.4)	54 (81.8)	
How you consider your own health						
Not very good	11 (7.4)	5 (21.7)	0.106	27 (11.9)	12 (18.2)	0.191
Cannot inform	6 (4.0)	0 (0.0)		16 (7.1)	7 (10.6)	
Good	68 (45.6)	11 (47.8)		108 (47.8)	33 (50.0)	
Better	64 (43.0)	7 (30.4)		75 (33.2)	14 (21.2)	

* Pearson's chi-square p≤0.05.

DISCUSSION

This study identified a high prevalence of malnutrition risk in older adult diabetics (47.1%). According to Saintrain et al.[13], both diabetes and the aging process are risk factors for malnutrition, since both increase the possibility of geriatric comorbidities, such as functional deficiencies, cognitive dysfunctions, depression and polypharmacy, consequently compromising self-care for the disease[14]. What's more, diabetes can interact with the common changes of ageing, accelerating the progression of various complications of the disease[15].

With regard to gender, the prevalence of risk of malnutrition/malnutrition in older adult diabetics was 15.7% in males and 30.1% in females. Similarly, Saintrain et al.[13] found a prevalence of risk of malnutrition in older adult diabetics of 16.7% in males and 21.7% in females, but no significant correlation between gender and nutritional status.

Weight loss was an important aspect observed in this study. The group with diabetes showed greater weight loss in the last three months compared to older adult people without the disease. As they get older, individuals with diabetes lose more lean mass compared to those without the disease[16]. Bellary et al.[17] point out that diabetes can intensify the decline in muscle mass and strength. In addition, unintentional weight loss, along with other factors such as inadequate diet, puts diabetics at risk of malnutrition[13].

Another important factor is the use of polypharmacy, i.e. the routine and concomitant use of medicines[9]. This study found that older adult diabetics use multiple medications to a greater extent than older adult people who don't have the disease. According to Remelli et al.[18], the use of multiple medications in diabetics can increase the risk of negative health repercussions, such as reduced quality of life. In addition, polypharmacy can cause pain and increase the risk of drug interactions, which

interfere with the course of the disease[14], in addition to being associated with malnutrition due to side effects such as lack or loss of appetite and nausea[19].

In general, diabetes causes a decline in the physical, social and psychological health of the older adult, thus reducing their quality of life[20]. In the study, compared to those without the disease, older adult people with diabetes reported a worse view of their own health condition. A similar result was found in the study by Amin et al.[21], which found that 25.0% of the diabetics studied were dissatisfied with their own health.

According to Correa Avila C et al.[22], the complications resulting from the disease are strongly related to a decline in quality of life. The physical and emotional impacts that the disease has on the older adult culminate in a decrease in their autonomy and self-confidence, so that their self-perception of health becomes compromised[23].

The results of the study showed a higher prevalence of mild dementia, dementia or severe depression in diabetics when compared to non-diabetic older adult people, especially in males, and it is worth noting that older adult people with severe cognitive impairment were excluded from this study. According to Tamura et al.[8], diabetes is intrinsically linked to cognitive impairment and dementia, which can affect visual and verbal memory as well as the execution of functions. Cognitive impairment contributes to weight loss and malnutrition due to various factors, such as difficulty swallowing, which usually occurs in conjunction with dementia, or even difficulty eating due to a decrease in the execution of functions[24].

The disease can also cause mood swings and low self-esteem, which are symptoms associated with depression[22]. Notable results on this issue were found in the study by Briganti et al[25], which showed a prevalence of depressive symptoms close to 22.5% in the diabetics assessed.

With regard to mobility, it was observed that older adult diabetic men had greater impairment. Diabetes is associated with a high risk of functional disability and, according to studies, men with diabetes have been shown to have significant mobility impairments[26]. Mobility problems can lead to functional impairments in everyday activities that naturally lead to reduced food intake and consequent malnutrition, such as the inability to obtain or prepare food[27].

It should be noted, therefore, that diabetes is associated with malnutrition because it is a chronic and catabolic disease, as well as leading to various complications at risk of malnutrition, such as a decline in cognitive and functional status, possible side effects of medication, decreased appetite and accelerated loss of muscle mass and strength[28]. Malnutrition in the older adult is related to increased morbidity and mortality, with implications for daily activities and a negative impact on quality of life[29].

One limitation of this study concerns the self-reported diagnosis of diabetes, but this is a strategy used in several population-based studies. On the other hand, relevant aspects should be considered: the use of the Mini Mental State Examination[11], minimizing memory bias, and the use of the MAN, which makes it possible to assess the overall nutritional status of the older adult.

CONCLUSION

The results revealed a significant prevalence of malnutrition risk in older adult with diabetes mellitus, indicating that the disease can negatively influence nutritional status. This highlights the importance of nutritional assessment in the care of patients with diabetes mellitus, especially the older adult, as it can help to reduce malnutrition and, consequently, improve the quality of life of these individuals. Nutritional assessment is essential for implementing measures to improve general health and encourage healthy ageing.

Additionally, we stress the need for an integrated approach, involving health professionals and caregivers, to ensure a comprehensive analysis of each patient's specific nutritional needs. Furthermore, the establishment of educational programs can empower both the older adult and their families to adopt healthier eating practices, thus preventing complications related to malnutrition associated with diabetes mellitus. These holistic initiatives are key to promoting a complete and effective approach to the nutritional care of older adult people with this condition.

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