

PREVALENCE OF FRAILTY SYNDROME AMONG TYPE 2 DIABETES MELLITUS ELDERLY PATIENTS

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Abstract. Frailty defined by decreased adaptability to stress factors as a result of decreasing functional reserves is one issue discussed more and more often by those that care for the elderly and are concerned about their quality of life. Frailty leads to an increased vulnerability to the loss of physiological functions that becomes visible in stress conditions. The association of frailty with chronic disease, like diabetes mellitus leads to poor prognosis for the elderly patient. This study aims to establish a correlation between frailty syndrome and diabetes mellitus type 2 in the elderly patient. Also, the study aims to calculate the prevalence of frailty syndrome among elderly diabetics and also to evaluate the relation between the degree of diabetes control and the evolution of the frailty syndrome. The increased prevalence of this syndrome with the elderly patient with diabetes increases the need for medical interventions in order to prevent evolution to serious complications. The study documents the prevalence of frailty syndrome with 23.3% frail patients and an equal percentage of pre-frail patients of the total study group. The prevalence of frail elderly, among the elderly included in this study is 46.66%.

Key words: frailty, diabetes mellitus, elderly

PREVALENȚA SINDROMULUI DE FRAGILITATE LA PACIENȚII VÂRSTNICI CU DIABET ZAHARAT TIP 2

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Rezumat. Fragilitatea definită de scăderea capacității de adaptare la factori de stress ca urmare a scăderii rezervelor funcționale este una dintre problemele puse în discuție, tot mai des, de cei care îngrijesc vârstnici și sunt preocupați de calitatea vieții acestora. Fragilitatea aduce o vulnerabilitate crescută la pierderea funcțiilor fiziologice și care devine vizibilă în condiții de stress. Asocierea fragilității cu boli cronice, cum este și diabetul zaharat, determina evoluții cu prognostic grav în viața pacientului vârstnic. Acest studiu își propune stabilirea unei corelații între sindromul de fragilitate și diabetul zaharat tip 2 la pacientul vârstnic. De asemenea, studiul urmărește calcularea prevalenței sindromului de fragilitate în rândul pacienților vârstnici diabetici dar și evaluarea relației dintre gradul de control al diabetului și evoluția sindromului de fragilitate. Prevalența crescută a acestui sindrom la pacientul vârstnic, diabetic ridică nevoia de intervenții, care să reducă evoluție spre complicații grave. Studiul documentează o prevalență a sindromului de fragilitate de 23,3% fragili și un procent egal de pre-fragili de vârstnici din totalul lotului de studiu. Prevalența vârstnicilor fragili, din totalul vârstnicilor incluși în studiu este de 46,66%.

Cuvinte cheie: fragilitate, diabet zaharat, vârstnic

INTRODUCTION

The association of frailty with chronic disease, like diabetes mellitus leads to poor prognosis for the elderly patient [1, 2].

Demographic data mention an increase in the number of elderly people who, through multiple, chronic and progressive suffering evolving into complications, attract a

growing need for specialized care and multidisciplinary management [3, 4].

In close connection with the ageing phenomenon, the published literature is beginning to outline a new syndrome - the frailty syndrome, whose definition has stirred up some controversy. At present, it is considered to be a multidimensional geriatric syndrome [5], as a consequence of decreasing physiological reserves concomitant with a multisystem disorder and a limited capacity to maintain homeostasis [6]. Two frailty patterns have been accepted: the frailty phenotypes and Rockwood's frailty index. The frailty phenotypes proposed by Fried and colleagues in the CHS study, a cohort study of more than 5,300 subjects, are: a decrease in muscular grip strength, decreased walking speed, decreased physical activity level, fatigue, unintended weight loss [2,7]. Thus, the presence of frailty in the elderly patient increases the risk of a serious evolution such as falls, disabilities and mortality [8].

Frailty seems to be associated, as studies have shown, with serious illnesses and physiopathological changes at the level of the endocrine system and inflammatory response level, as well as with malnutrition or obesity [9].

This study aims to establish a correlation between the frailty syndrome and type 2 diabetes mellitus in elderly patients. The study also aims to track the prevalence of the frailty syndrome among elderly diabetic patients, as well as to assess the relationship between the degree of managing diabetes and the evolution of the frailty syndrome.

METHODS

Subjects

Participants in the study are patients admitted to "Ana Aslan" INGG between December 2015 and May 2016. Two patient groups were selected with an equal number of participants, broken down by age groups as follows: Lot 1 aged 50-64

and lot 2 aged ≥ 75 years. Exclusion criteria are type 1 diabetes, MMSE score less than 12 points.

Data collection

The data needed to achieve the study's objectives were collected from the observation records of the patients included in the study and by using the standardized Frail Scale questionnaire. Thus, the parameters collected from the observation records are: the duration of diabetes evolution, the maximum glycemia value, the value of the last fasting glycemia, the glycated hemoglobin (HbA1c), the body mass index (BMI), the presence of comorbidities (hypertension, heart failure, heart ischemic disease, myocardial infarction, stroke, renal failure nephropathy, chronic pulmonary disease, asthma, neoplasia, arthrosis, MMSE test, GDS depression scale evaluation, nutritional assessment using the Mini Nutritional Assessment (MNA) scale.

The Frail Scale Questionnaire is used in order to establish the frailty status. At least three positive responses to the five questions of the questionnaire qualify the patient as frail, one or two positive responses qualify the as pre-frail, and all negative responses qualify the subject as non-frail.

The inclusion criteria were those related to age groups, 50-64 years old and over, or equal to 75 years, as well as the diagnosis of type 2 diabetes (DM).

Statistical analysis

This is a case-control study where type 2 DM was considered the risk factor to which the patients were previously exposed.

The data obtained were centralized using the online Google Forms application and subsequently processed in a database using the Microsoft Excel 2010 spreadsheet program; the same program was used to draw the charts.

To compare the frequency of comorbidities in different age groups and sexes, I used Independent Samples T-test equations.

The correlation of the frailty score in lot 1 and in lot 2 with the duration of diabetes and the degree of diabetes management was made using the Pearson correlation equation.

RESULTS

The study followed a total of 120 subjects with an equal number of patients for each

age group. In each age group, the gender distribution was also equal. In the adult group, most of the participants come from urban areas and have a medium or higher education level. In comparison, most elderly adults come from rural areas and have a predominant level of primary school education (Tab. I).

Tab. I Socio-cultural study groups' characteristics.

		Adults (50-64 years) N=60	Older adults (≥ 75 years) N=60
		%/Mean (SD)	%/Mean (SD)
Age		61,83 (2.46)	78,13 (3.02)
Education	Primary school	12,33	48,33
	High school	46,66	33,33
	University	41	18,33
Settlement	Urban	81,66	78,33
	Rural	18,34	21,66

The average developmental duration of diabetes is 12.43 years among adult men and 13.43 among adult women, while in the elderly it is higher, as expected, 15.9 years in elderly men and 17 years in elderly women. Comparing the mean value of the maximum blood glucose in lot 1, men versus women, there a no statistically significant differences ($p > 0.05$). However, comparing these values in lot 2, statistically significant differences (p

< 0.05) are obtained. By comparing the mean value of the maximum blood glucose between the two lots, a small statistically significant difference is obtained (Tab. II). The study also evaluated the presence of other geriatric syndromes, such as cognitive impairment, urinary incontinence, falls and malnutrition as shown in Tab. II. In this assessment, a clear incidence of syndromes among women in both age groups can be noticed.

Tab. II Patients' characteristics in adults and older adults groups

Characteristics		Adults (50-64 years)	Old adults (≥ 75 years)	p value	
Mean duration of DM (years)	Male	12.43	15.9		
	Female	13.43	17		
Patient distribution according to the duration of DM evolution N (%)	<1 year	Male	1 (1.66)	0	
		Female	1 (1.66)	0	
	1-5 years	Male	10 (16.66)	8 (13.33)	
		Female	10 (16.66)	3 (5)	
	5-10 years	Male	11 (18.33)	8 (13.33)	
		Female	9 (15)	6 (10)	
	10-19 years	Male	7 (11.66)	11 (18.33)	
		Female	10 (16.66)	15 (25)	
> 20 years	Male	1 (1.66)	3 (5)		
	Female	0 (0)	6 (10)		
Mean maximum blood sugar level (mg/dl)	Male	214.2	210.1	<0.05	
	Female	234.64	285.67		
Last recorded mean blood sugar level (mg/dl)	Male	129.6	135.86		
	Female	140.26	149.73		

Patient distribution according to type of treatment for DM N (%)	Diet	Male	7 (11.66)	1 (1.66)	<0.05
		Female	5 (8.33)	5 (8.33)	
	OAD	Male	19 (31.66)	21 (35)	
		Female	22 (36.66)	18 (30)	
	Insulin	Male	4 (6.6)	8 (13.33)	
		Female	3 (5)	7 (11.66)	
Geriatric syndromes N (%)	Cognitive impairment*	Male	0	9 (15)	<0.05
		Female	0	11 (18.33)	
	Depression*	Male	1 (1.66)	11 (18.33)	
		Female	16 (26.66)	15 (21.6)	
	Urinary incontinence	Male	4 (6.66)	14 (23.33)	
		Female	10 (16.66)	12 (20)	
	Falls	Male	2 (3.33)	4 (6.66)	
		Female	3 (5)	5 (8.33)	
	Malnutrition*	Male	0	0	
		Female	0	0	

* cognitive impairment - MMSE cut off score of 24 [10]; depression – GDS cut off score of 6 [11]; Malnutrition – MNA cut off score of 11[12]

Fig. 1 highlights the greater distribution of comorbidities among elderly patients, as expected. Among the most frequent comorbidities is high blood pressure both in lot 1 (where it is found in 31.67% of men, compared to 40% of women) and in lot 2 (50% among man and 43.3% among women).

In lot 1, the prevalence of most comorbidities among subjects is higher in women than in men (Myocardial infarction, kidney diseases and heart failure are

prevalent among adult women, 26.67%, 18.3% and 13.3% compared to men, with prevalence of 6.6%, 3.3% and 5%).

In the lot of elderly adults, heart failure, angina pectoris, asthma and COPD have higher prevalence among men, appearing in 25%, 20%, 16.66% and 6.66% of patients respectively compared to the women in the same group, affected in proportion of 11.66%, 16.66%, 8.33% and 3.33%, respectively.

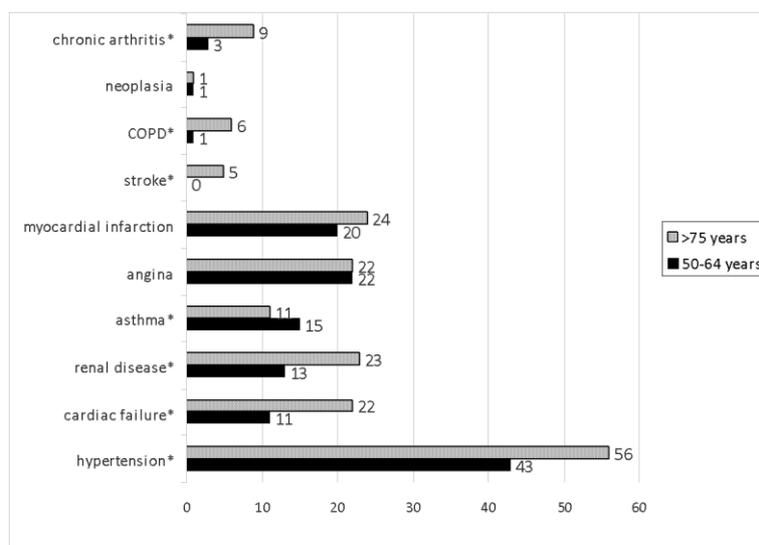


Fig. 1 Distribution of comorbidities in adult and older adult groups; * = T- Test $p < 0,05$ (CI 95%).

Of those aged 50-64, 25.83% are non-frail, 19.16% are pre-frail and only 5% are frail. Of those ≥ 74 years, only 3.3% are non-frail, 23.3% are pre - frail, and 23.3% are frail. It can be noticed that in lot 1, that of the adults, non-frail and pre-frail patients predominate compared to group 2, that of the elderly, with predominantly pre - frail and frail patients. There is a high statistically significant difference between the two lots ($p < 0.01$).

The distribution of the patients in lot 1 and lot 2, depending on the sex, and the result obtained after applying the Frail Scale questionnaire are shown in Tab. III. There is a statistically significant difference ($p < 0.01$) in the proportion of frailty and pre-frailty among women compared to the men in the adult category. In the older adults category, there is a statistically significant ($p < 0.05$) proportion of frailty among women compared to men.

Tab. III Patient distribution between the studied groups regarding frailty phenotypes

Clinical phenotypes of frailty	Adults (50-64 years)		Old adults (≥ 75 years)	
	Male	Female	Male	Female
Frail % (N)	0	10 (6)	18,3 (11)	28,3 (17)
Pre-Frail % (N)	11,66 (7)	28,3 (16)	26,66 (16)	20 (12)
Robust % (N)	36,66 (22)	15 (9)	5 (3)	1,66 (1)

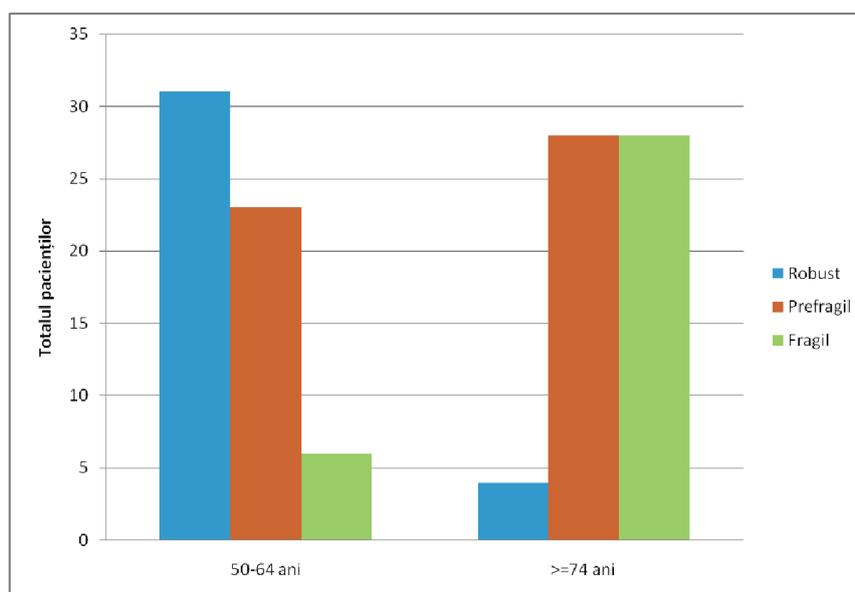


Fig. 2 Distribution of all the patients included in the study based on the frailty index score

A significant positive correlation was found between the frail score and the duration of diabetes and the level of glycemic control in groups I and II (Tab. IV).

Thus the duration of exposure to diabetes mellitus can be a risk factor for increasing

the incidence of fragility syndrome. High and poorly controlled blood glucose levels increase the risk of developing co-morbidities and associating frailty syndrome with a higher degree of gravity (by the presence of a greater number of symptoms that it is defined by).

Tab. IV Correlation between Frail test scores and duration of exposure to risk factor (DM), glycemic values, glycosylated hemoglobin values

Variables	Frail scale	
	Adults (50-64 years)	Old adults (≥ 75 years)
Duration of diabetes (years)		
Pearson's correlation	0.816	0.865
p	<0.001	<0.001
Fasting blood glucose (mg/dl)		
Pearson's correlation	0.851	0.918
p	<0.001	<0.001
HbA1c (%)		
Pearson's correlation	0.858	0.897
P	<0,001	<0,001

DISCUSSIONS

The results of this study demonstrate the impact that diabetes mellitus has on frailty syndrome among elderly patients compared to adults.

The frailty component is significantly higher among elderly and affects more often women in both age groups. The difference in incidence of frailty syndrome between men and women decreases with age.

There are no frail men in the adult group, compared with women that are represented by 10% in the same group. Therefore, we can conclude that women are more affected at a younger age by frailty than men.

The first positive symptom in the 'frail scale' evaluation reported by the adult women was the inability to climb 10 steps without difficulty, followed by walking. Among men, the main symptoms reported were fatigue, difficulty climbing 10 steps and involuntary weight loss, all representing 1.67% of symptoms.

Elderly women reported as the primary symptom fatigue (26.67%), followed by difficulty in climbing 10 steps (6.67%). Elderly men report in equal measure the presence of fatigue and difficulty in climbing 10 steps as the primary symptoms, accounting to 18.3%.

Multiple co-morbidities were encountered in 16.67% of elderly men, the majority of the group being represented by frail and pre-frail. Compared with the adult group, the frail elderly have a higher prevalence

of co-morbidities, which were not present in the non-elderly group, such as stroke, cardiac failure, COPD. The symptoms encountered in the elderly frail women group were in decreasing order high blood pressure, angina pectoris, cardiac failure and arthritis.

We can conclude that the unfavorable evolution of the degree of frailty is correlated with a higher number of symptoms.

The results of this study highlight a poorer metabolic control in older diabetic patients compared to younger ages. Diabetic comorbidities were also more prevalent in older age.

The elderly group is significantly associated statistically with a longer exposure period to the risk factor – diabetes mellitus, but also to average blood sugar levels with higher HbA1c indicating poor glycemic control and by association a worse evolution toward complications.

CONCLUSIONS

The elderly group can also be significantly associated statistically with a higher number of events and symptoms that define the frailty syndrome. The prevalence of frailty syndrome is higher among elderly, compared with adults, and women are more affected by this syndrome than men, regardless of age.

We consider that the study's limitations are the small number of sample (n=120) and their selection from a single institution.

Conflicts of interest

The authors declare no conflicts of interest.

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