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ORIGINAL ARTICLE

THE FEV1 / FVC RATIO IS NOT PREDICTIVE OF FRAILTY SYNDROME IN THE ELDERLY

A RELAÇÃO VEF₁/CVF NÃO É PREDITORA DA SÍNDROME DA FRAGILIDADE EM IDOSOS LA RELACIÓN VEF₁/CVF NO ES UN PREDICTOR DEL SÍNDROME DE FRAGILIDAD EM ANCIANOS

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ABSTRACT

Objective: to evaluate the association between forced expiratory volume ratio in the first second and forced vital capacity (FEV1/FVC) with Frailty Syndrome (FS) in the elderly. **Method:** cross-sectional, population-based, quantitative approach. For the analysis, multivariate logistic regression was performed. **Results:** 162 elderly patients, with FS prevalence of 13.6% and mean age of 70.7 years (± 6.9) were studied. There was no association between FEV1/FVC and FS (OR = 0.98, 95% CI: 0.94-1.02, $p = 0.352$), nor a percentage of predicted FEV1/FVC and FS values (OR = 0.98; 95% CI: 0.95-1.01, $p = 0.342$), regardless of age group and self-perceived health. **Conclusion:** the FEV1/FVC ratio is not able to predict Frailty Syndrome in community-dwelling elderly. **Descriptors:** Frail Elderly; Respiratory Function Tests; Spirometry.

RESUMO

Objetivo: avaliar a associação entre a relação volume expiratório forçado no primeiro segundo e capacidade vital forçada (VEF₁/CVF) com a Síndrome da Fragilidade (SF) em idosos. **Método:** estudo analítico, transversal, de base populacional, com abordagem quantitativa. Para as análises, foi realizada regressão logística multivariada. **Resultados:** foram estudados 162 idosos, com prevalência da SF de 13,6% e média de idade de 70,7 anos ($\pm 6,9$). Não houve associação VEF₁/CVF e SF (OR = 0,98; IC95%: 0,94-1,02; $p = 0,352$) e nem percentual do valor predito da VEF₁/CVF e SF (OR = 0,98; IC95%: 0,95-1,01; $p = 0,342$), independentemente do grupo etário e autopercepção de saúde. **Conclusão:** a relação VEF₁/CVF não é capaz de prever a Síndrome da Fragilidade em idosos residentes em comunidade. **Descritores:** Idoso Fragilizado; Testes De Função Respiratória; Espirometria.

RESUMEN

Objetivo: evaluar la asociación entre la relación volumen espiratorio forzado en el primero segundo y capacidad vital forzada (FEV1 / FVC) con el Síndrome de Fragilidad (SF) en los ancianos. **Método:** Estudio analítico, transversal, basado en la población con un enfoque cuantitativo. Para los análisis, se realizó regresión logística multivariante. **Resultados:** se estudiaron 162 ancianos, con una prevalencia de SF 13,6% y una edad media de 70,7 años ($\pm 6,9$). No hubo asociación FEV1 / FVC y SF (OR = 0,98; IC de 95%: 0,94 a la 1,02; $p = 0,352$), y ni un porcentaje del valor predicho de FEV1 / FVC y SF (OR = 0,98; IC del 95%: 0,95 a 1,01; $p = 0,342$), independientemente del grupo de edad y autopercepción de salud. **Conclusión:** La relación VEF₁/CVF no es capaz de predecir el Síndrome de Fragilidad en los ancianos que viven en comunidad. **Descriptor:** Anciano Frágil; Pruebas de Función Respiratoria; Espirometria.

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INTRODUCTION

Frailty Syndrome (FS) is a determinant of adverse outcomes (falls, hospitalization, institutionalization and death) in the elderly.¹ Recent studies point to low pulmonary function in frail elderly,² however, good and practical spirometric markers have not yet been identified for FS screening in this population.

The forced expiratory volume ratio in the first second and forced vital capacity (FEV1/FVC) translates to tracheobronchial airflow capacity, it declines significantly with age, and well-preserved values of this relationship confer survival advantage. In elderly chronic obstructive patients, the reduction of FEV1/FVC is associated with increased mortality and low functional capacity.³

No population studies evaluating the association between FEV1/FVC and FS were found. So, the objective of the study was to verify the association of forced expiratory volume ratio in the first second and forced vital capacity with Frailty Syndrome in elderly residents in community.

Analytical and cross-sectional study, with a quantitative approach, population basis research cut << Nutritional status, risk behaviors and health conditions of the elderly of Lafaiete Coutinho-BA >>, from the Center for Studies in Epidemiology of Aging (CSEA) of the Southwest Bahia State University (UESB) - Jequié-BA campus, with support from the State of Bahia Research Foundation (FAPESB) and UESB.

A census of the elderly (≥ 60 years) enrolled in the Family Health Strategy, covering 100% of the municipality, was carried out. Elderly patients with insufficient criteria for the construction of the SF1 phenotype were excluded, who did not meet the recommendations of the Pulmonary Function tests³ and with age and anthropometric data outside the adequacy range of the spirometric

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prediction equations.⁴ The final population consisted of 162 individuals.

Dependent Variable: Frailty Syndrome was defined based on an adapted version of the criteria proposed by Fried et al.¹, which considers five components: low strength, weight loss, idling, low resistance and low level of physical activity. Details on the information collection and operation of the variable were previously published.⁵

Independent variables: The FEV1/FVC ratio, expressed as the percentage of a normal predicted value⁴, were obtained through MicroLab™ Spirometer (Care Fusion - USA).

Explanatory variables: age group, smoking, respiratory symptoms, hospitalization in the last year, functional capacity, self-perception of health and use of medications. These variables were selected based on a hierarchical logistic model and previously designed to identify possible determinants of Frailty.

Statistical procedure: The association between the Frailty syndrome and the independent variables was tested by multiple logistic regression. Adjusted models were designed to estimate the odds ratios (OR) and their respective 95% confidence intervals (95% CI). A significance level of 5% (α = 0.05) was adopted. The data was tabulated and analyzed in IBM SPSS Statistics for Windows (SPSS 21.0.2012, Armonk, NY: IBM Corp.).

The research project was approved by the Research Ethics Committee of the State University of Southwest of Bahia / UESB (CAAE nº 24804613.8.0000.0055).

The prevalence of FS was 13.6%, of which 22 were frail and 140 were not frail. Table 1 shows the distribution of the elderly according to age, height and BMI, stratified by sex, descriptive data of FEV1/FVC and predicted values for the Brazilian population for FEV1/FVC.

RESULTS

Table 1. Descriptive analysis of quantitative and qualitative variables of population characterization. Lafaiete Coutinho (BA), Brazil, 2014.

Quantitative Variable	Average	Standard Deviation	Minimum-maximum value
Age			
Female	70.7	6,9	60-85
Male	71.6	7.1	60-85
Height (cm)			
Female	148.8	5.7	135.0-169.8
Male	162.32	7.2	149.0-179.6
BMI (kg / m 2)			
Female	28.8	4.1	19.2-36.6
Male	24.2	3.6	18.0-36.4
FEV1 / FVC	78.9	10.9	48.0-106
FEV1 / FVC *	99.4259	14.7	31.0-124
Qualitative Variables	%Answers	Frailty Syndrome	
		Not Frail	Frail
MEEM	100		
≥13		114 (87.0%)	17 (13.0%)
<13		23 (82.1%)	05 (17.9%)
Know how to read and write a message	98.1		
Yes		58 (86.6%)	9 (13.4%)
No		80 (87.0%)	12 (13%)
Self-reported race / color	98.1		
White		34 (91.9%)	3 (8.1%)
Not White		103 (84.4%)	19 (15.6%)

BMI = Body mass index (kg / m2); MMSE = Mini-Mental State Exam - maximum scale of 19 points; FEV1/FVC = ratio between Forced Expiratory Volume in the First Second (FEV1) and Forced Vital Capacity (FVC); FEV1 / FVC * = percentage of the predicted normal value of FEV1 / FVC for the Brazilian population.⁴

The results of the crude analysis of the association between FS and explanatory variables showed that only the sex and BMI

variables did not reach statistical significance (p <0.20) to enter the multiple model (Table 2).

Table 2. Gross association between sociodemographic, behavioral, health conditions and Frailty Syndrome in elderly residents in the community. Lafaiete Coutinho (BA), Brazil, 2014.

Variables		Frailty Syndrome				
		% Answers	N	%	OR _{gross} (IC95%)	p- value
Sex	100					0.834
Female			85	52.5	1.10 (0.45-2.71)	
Male			77	47.5	1	
Age Group	100					
60 - 69 years			68	42.0	1	
70 - 79 years			72	44.4	1.8 (0.57-5.68)	0.315
≥ 80 years			22	13.6	7.20 (2.04-25.3)	0.002
Use of cigarettes	98,8					
Never smoked			69	43.1	1	
Ex smoker			76	47.5	2.37 (0.86-6.57)	0.097
Smokes currently			15	9.4	0.75 (0.08-6.73)	0.797
Respiratory Symptoms	92,6					0.061
No			117	78.0	1	
Yes			33	22.0	2.56 (0.96-6.84)	
Hospitalization in the last year	100					0.015
Not once			139	85.8	1	
One or more times			23	14.2	3.61 (1.28-10.20)	
Number of chronic diseases	93,8					
None			20	13.2	1	
An			56	36.8	1.45 (0.49-4.286)	0.497
Two or more			76	50.0	2.96 (1.07-8.18)	0.036
Functional capacity	99,4					
Independent			107	66.5	1	
Dependent on IADL			31	19.3	4.97 (1.64-15.0)	0.005
Dependent on BADL and IADL			23	14.3	6.250 (1.93-20.2)	0.002
Self-perception of health	100					0.012
Positive			72	44.4	1	
Negative			90	55.6	4.25 (1.37-13.2)	
Use of medication	100					0.158
Up to one			59	36.4	1	
Two or more			103	63.6	2.13 (744-6.12)	
BMI	100					
Low weight			35	21.6	0.79 (0.23-2.71)	0.705
Appropriate weight			71	43.8	1	
Overweight			56	34.6	1.02 (0.37-2.77)	0.974

OR = odds ratio; CI = confidence interval; BMI = Body mass index.

In the final multiple logistic regression model, only the variables age group ($p = 0.003$) and health self-perception ($p = 0.018$) remained as adjustment variables to verify the association between FS and FEV₁/FVC. The adjusted multiple logistic regression models showed that FS was not associated with FEV₁/FVC (OR = 0.98, 95% CI: 0.94-1.02, $p = 0.352$), nor with the FEV₁/FVC predicted percentage (OR = 0.98, 95% CI: 0.95-1.01, $p = 0.342$), regardless of age group and self-perceived health.

DISCUSSION

The FEV₁/FVC ratio is decisive for the diagnosis of obstructive pulmonary diseases⁶, it has a direct relationship with exercise capacity, functional capacity and survival.³ However, the FEV₁/FVC ratio and FEV₁/FVC, ratio is expressed as the percentage of normal predicted value, was not able to predict Frailty Syndrome (FS) in elderly residents of the community.

The respiratory system is one of the most affected during the aging process due to morphological changes and exposure to environmental pollutants over the years. There is a loss of chest wall mobility, pulmonary parenchyma elasticity, loss of mass and respiratory muscle strength, and tendency to bronchiolar expiratory collapse in elderly individuals. These changes, together with respiratory infections, smoking and frequent exposure to toxic particles of the environment, may lead to airflow limitation, defined, mainly, by a decrease in FEV₁/FVC.²

The hypothesis of this study for the non-association between FEV₁/FVC and FS is that, because it is a mathematical relationship, the reduction of FVC, even against a reduced FEV₁, may confer normal values of FEV₁/FVC. Thus, characteristics present in the elderly population may make it impossible to achieve a maximal forced expiration and long enough, reducing FVC, such as low comprehension and schooling, low functional capacity.³

Another important observation is that restrictive pulmonary pathologies (characterized by low FVC) have FEV₁/FVC within normal values, or may even increase this relation. These disorders are less researched than obstructive ones, however, it presents a prevalence of 12.5% to 14.5% in adults over 40 years. They are associated with dyspnea on exertion, limitation for physical activity and activities of daily living, poor health and quality of life, and are often incapacitating for the elderly population.³

Evaluating a cohort (1989-2002) from the Cardiovascular Health Study (CHS), with more

than 3,500 elderly Americans, all Caucasian subjects, Vaz Fragoso et al.² found a strong association between respiratory problems (flow limitation and Standard) with the diagnosis of FS. FEV₁/FVC was not used in isolation or as the percentage predicted for the population studied, which differed from this study. For the purpose of the analyzes, the researchers categorized the elderly from lambda-mu-sigma (LMS), determining the lower limit of normality for FEV₁/FVC and FVC values as the fifth percentile of the Z-score distribution. This strategy allows analysis variability and asymmetry in relation to predicted FEV₁/FVC and FVC values. Evidence of this strategy is still limited, however, it is a methodological alternative to evaluate respiratory function in the elderly.²

Thus, in the case of older adults, the most accepted strategy for studying respiratory function is Vaz Fragoso et al.². There is still a need for further studies in this area, evaluating other spirometric parameters, mainly peak flows and fractions forced expiratory volume measured at times greater than one second.

Among the limitations, the losses of the elderly in the final population of the study, can be pointed out, which can be explained by selection bias, since most of the national and international studies involving spirometric evaluation in the elderly are not population-based and may not represent the real universe of elderly residents in the community.

CONCLUSION

The FEV₁/FVC ratio and the percentage of normal predicted FEV₁/FVC values are not able to predict Frailty Syndrome in community-dwelling elderly. Further studies are needed to identify good and practical spirometric markers for screening for Frailty Syndrome.

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