ORIGINAL ARTICLE

Association between frailty syndrome and family functioning among older adults with diabetic retinopathy

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ABSTRACT

Objective: To determine the association between frailty syndrome and family functioning among older adults with diabetic retinopathy.
Materials and methods: An analytical and cross-sectional study conducted among patients diagnosed with diabetic retinopathy. The ophthalmology department diagnosed diabetic retinopathy through pupil dilation, administration of tetracaine and ophthalmoscopy. Three groups were determined using the FRAIL questionnaire: frail, prefrail and nonfrail; the sample sizes were 39, 64 and 76, respectively, matched by age. The study variables included age, sex, education level, marital status and occupation. Additionally, the time since diagnosis of diabetic retinopathy was measured. Furthermore, the type of family was determined according to Huerta's classification, which identifies nuclear family, extended family, composite extended family, single-parent family and blended family. Family functioning was evaluated with the family functioning questionnaire (FF-SIL). The statistical analysis included the chi-square test. The protocol was registered with the research and ethics committee of the health institution, and surveys were administered after obtaining informed consent.
Results: The median ages in the frail (73 years), prefrail (71 years) and nonfrail (70 years) groups were statistically similar (p = 0.061). The prevalence of living as a couple was 23.07 % in the frail group, 48.43 % in the prefrail group and 60.52 % in the nonfrail group, with statistically significant differences among these groups (p = 0.001). There was an association between frailty syndrome and type of family functioning: in the nonfrail group, 88.16 % had a functional family, compared to 46.87 % in the prefrail group and 15.38 % in the frail group (p = 0.000).
Conclusions: There is an association between frailty syndrome and family functioning among geriatric patients with diabetic retinopathy.

Keywords: Frailty; Diabetes Mellitus; Geriatrics (Source: MeSH NLM).

INTRODUCTION

Diabetic retinopathy is a progressive and silent eye disease characterized by the development of microaneurysms and intraretinal hemorrhages, leading to a gradual decline in vision. Globally, it is one of the leading causes of visual impairment, with older adults being the most affected group. This population is 1.5 times more likely to experience blindness [1,2].

Several factors influence disease progression and functional limitations, including diabetes duration, glycemic control, smoking, lipid levels and hypertension. In older adults, retinopathy impacts quality of life, contributes to frailty syndrome and can disrupt family dynamics and functioning [2-4].

Frailty syndrome is an age-related, multifactorial condition characterized by diminished strength, resistance and reduced physiological functions, resulting in increased vulnerability to acute and chronic stressors, as well as greater functional dependence. The literature describes various instruments for assessing frailty, each adapted to different clinical contexts. Ensrud's questionnaire is easy to administer but provides limited information due to its brevity. Fried's Frailty Phenotype defines the physical model of frailty, but its use is limited by the need for a dynamometer to measure grip strength. Lastly, the FRAIL questionnaire assesses fatigue, resistance, ambulation, illnesses and loss of weight, offering greater objectivity and high internal and external reliability [5-10].

Family functioning evaluates the dynamics of affectional bonds among family members and their ability to adapt to challenges. Chronic diseases in older adults can negatively impact such functioning. It can be assessed from an individual perspective using the Family APGAR scale or from a collective nuclear family perspective with the family functioning questionnaire (FF-SIL) [11-15].

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When an older adult experiences illness and loss of autonomy, the family must adapt, affecting its dynamics and potentially influencing disease progression, treatment adherence and recovery. This adaptation process may even become a risk factor for complications [14,16-19].

In this context, the study aims to determine the association between frailty syndrome and family functioning among older adults with diabetic retinopathy.

MATERIALS AND METHODS

Study design and population

An analytical and cross-sectional study conducted among patients diagnosed with diabetic retinopathy. Participants were affiliated with a social security institution in San Juan del Río, Querétaro, Mexico, and received care between January 2022 and January 2023.

Variables and measurements

The ophthalmology department diagnosed diabetic retinopathy through pupil dilation, administration of tetracaine and ophthalmoscopy.

Patients were categorized into three groups based on their frailty status: frail, prefrail and nonfrail. Frailty was assessed using the FRAIL questionnaire [7], where a score of 0 indicated nonfrail, 1–2 indicated prefrail and ≥ 3 indicated frail.

The study variables included age, sex, education level, marital status and occupation. Additionally, the time since diagnosis of diabetic retinopathy was measured. Furthermore, the type of family was determined according to Huerta's classification [9], which identifies nuclear family, extended family, composite extended family, single-parent family and blended family.

Family functioning was evaluated with the FF-SIL [11], which categorizes families into four levels: functional, moderately functional, dysfunctional and severely dysfunctional.

Statistical analysis

The normality of the variables *age* and *time since diagnosis of diabetic retinopathy* was assessed using the Shapiro-Wilk test for the frail group and the Kolmogorov-Smirnov test for the prefrail and nonfrail groups. Medians and percentages were calculated. Age and time since diagnosis of diabetic retinopathy were compared using the Kruskal-Wallis test, while categorical variables were analyzed using the chi-square (X^2) test.

Ethical considerations

The protocol was registered with the research and ethics committee of the health institution, and surveys were administered before obtaining informed consent.

RESULTS

As for the age, a normal distribution was observed in the frail (p = 0.387) and prefrail (p = 0.069) groups but not in the nonfrail group (p = 0.00). The time since diagnosis of diabetic retinopathy did not follow a normal distribution in any group (frail: p = 0.00, prefrail: p = 0.00 and nonfrail: p = 0.00).

Statistical analysis showed no significant difference in median age between the frail (73 years), prefrail (71 years) and nonfrail (70 years) groups (p = 0.06). However, the median time since diagnosis of diabetic retinopathy significantly differed among the groups (p = 0.000) (Table 1).

Table 1. Comparison of age and time since diagnosis among frail, prefrail and nonfrail older adults with diabetic retinopathy

Parameter	Frail (n = 39)	Prefrail (n = 64)	Nonfrail (n = 76)	Kruskal-Wallis	p
Age (median, years)	73	71	70	5.58	0.06
Time since diagnosis of retinopathy (median, years)	3	2	1	27.81	0.00

The prevalence of living as a couple accounted for 23.07 % in the frail group, 48.43 % in the prefrail group and 60.52 % in the nonfrail group, with statistically significant differences among these groups (p = 0.00). Table 2 presents the distribution of sex, marital status, education level and occupation across the three groups.

Table 2. Comparison of personal characteristics among frail, prefrail and nonfrail older adults with diabetic retinopathy

Characteristic	Frailty syndrome			X^2	*p*
	Frail (*n* = 39)	Prefrail (*n* = 64)	Nonfrail (*n* = 76)		
	Percentage				
Sex					
Female	61.54	65.62	51.31	3.10	0.21
Male	38.46	34.38	48.69		
Living as a couple					
Yes	23.07	48.43	60.52	14.48	0.00
No	76.93	51.57	39.48		
Education level					
Primary education or lower	76.92	84.38	77.63	1.25	0.53
Secondary education or higher	23.08	15.62	22.37		
Occupation					
Homemaker	23.07	37.50	28.94		
Employed	10.25	7.81	11.85	2.92	0.57
Retired	66.68	54.69	59.21		

Table 3 presents the distribution of type of family among the study groups: 43.42 % of nonfrail patients, 34.37 % of prefrail patients and 30.79 % of frail patients belonged to a nuclear family (p = 0.62).

Table 3. Comparison of type of family among frail, prefrail and nonfrail older adults with diabetic retinopathy

Type of family	Frailty syndrome			X^2	*p*
	Frail (*n* = 39)	Prefrail (*n* = 64)	Nonfrail (*n* = 76)		
	Percentage				
Nuclear	30.79	34.37	43.42		
Extended	12.82	9.37	10.52		
Composite extended	17.94	31.25	22.38	6.18	0.62
Single-parent	17.94	12.50	13.16		
Blended	20.51	12.50	10.52		

An association was observed between frailty syndrome and family functioning. In the nonfrail group, 88.16 % had a functional family, compared to 46.87 % in the prefrail group and 15.38 % in the frail group (p = 0.00) (Table 4).

Table 4. Association between family functioning and frailty syndrome among older adults with diabetic retinopathy

Family functioning	Frailty syndrome			χ^2	*p*
	Frail (*n* = 39)	Prefrail (*n* = 64)	Nonfrail (*n* = 76)		
	Percentage				
Functional	15.38	46.87	88.16	70.84	0.00
Moderately functional	33.33	32.81	10.52		
Dysfunctional	41.02	18.75	1.32		
Severely dysfunctional	10.27	1.57	0.00		

DISCUSSION

From a demographic perspective, life expectancy has increased in modern society, accompanied by a growing trend toward aging, physiological decline and a higher prevalence of chronic diseases and related complications. Collectively, these factors create a challenging scenario for older adults. Therefore, identifying conditions associated with improved life expectancy presents an opportunity for both society and healthcare systems. It is in this context that the present study is situated [20-22].

Frailty syndrome is closely related to aging. The decline in physiological reserves is inversely proportional to the increase in age, raising the likelihood of dependence and vulnerability. This situation is exacerbated when frailty coexists with chronic disease complications [23]. Studies have indicated that visual impairment due to diabetic retinopathy affects older populations. Consequently, this study emphasizes the importance of age similarity across comparison groups to ensure valid results. Otherwise, the association between frailty syndrome and other variables, including family functioning, could be questioned. Early detection of frailty should be a fundamental component of geriatric assessment. Beyond managing chronic conditions, recognizing early signs of frailty is essential to implementing strategies that can delay or even reverse physical and cognitive decline, ultimately enhancing quality of life and reducing the risk of further complications [5,24].

This study found that living as a couple is associated with frailty syndrome. Some authors suggest that marriage may foster greater dependence in activities of daily living due to continuous caregiving. However, this contrasts with the perspective that living as a couple promotes stronger emotional and psychological bonds, encouraging mutual responsibility and concern, which in turn supports healthcare and emotional stability [25-27].

Diabetic retinopathy often results in sick leave among economically active older adults, leading to financial dependence. The literature suggests an association between low education levels, unemployment and frailty syndrome—a relationship not observed in this study. In general terms, education level is inversely proportional to age in the geriatric population, reflecting historical disparities in access to education. Additionally, functional decline increases with age, reducing the likelihood of employment due to physical limitations or exclusion from the labor market. Notably, age similarity across comparison groups in this research eliminated potential differences in frailty prevalence, which may explain the divergence from existing literature [5,26-29].

In this study, no significant association was found between frailty syndrome and type of family, suggesting that, beyond this variable, the quality of interpersonal relationships, role distribution and support networks within the family unit are more relevant. Older adults with diabetic retinopathy, facing both disease-related disabilities and age-related functional decline, inevitably require family support—whether emotional, social or financial. However, as this study was not specifically designed to assess these aspects, definitive conclusions cannot be drawn. Nonetheless, identifying the nuclear family remains critical in patient care, as family structures can provide a stable environment, facilitate care and mitigate frailty progression [12,27,30].

This study confirms an association between family functioning and frailty syndrome among geriatric patients with diabetic retinopathy. Effective family dynamics have been shown to support the acceptance and coping with chronic diseases among family members, as well as the care and adaptation to the specific needs of those affected. Conversely, a dysfunctional family environment may accelerate frailty progression and exacerbate chronic disease complications, including those related to diabetic retinopathy [16,17,31,32].

In conclusion, an association was observed between family functioning and frailty syndrome in older adults with diabetic retinopathy. In the nonfrail group, 88.16 % had a functional family, compared to 46.87 % in the prefrail group and 15.38 % in the frail group ($p = 0.00$). Recognizing frailty syndrome in this patient population enables the development of multidisciplinary management plans that support optimal chronic disease control, thereby preventing further frailty progression [33].

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