PREDICTION FACTORS OF FEAR OF FALLING IN OLDER ADULTS ASSESSED BY THE ICF DOMAINS: GENDER, SOCIAL PARTICIPATION, AND WALKING SPEED

FATORES DE PREDIÇÃO DO MEDO DE CAIR EM ADULTOS MAIS VELHOS AVALIADOS PELOS DOMÍNIOS DA CIF: GÊNERO, PARTICIPAÇÃO SOCIAL E VELOCIDADE DA MARCHA

FACTORES DE PREDICCIÓN DEL MIEDO A CAERSE EN ADULTOS MAYORES EVALUADOS POR LOS DOMINIOS DE LA CIF: GÉNERO, PARTICIPACIÓN SOCIAL Y VELOCIDAD DE LA MARCHA

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RESUMO

Objetivo: A Classificação Internacional de Funcionalidade, Incapacidade e Saúde (CIF) pode ser um modelo abrangente ideal para avaliação do risco de quedas. Há uma escassez de informações que relacionem a CIF com a avaliação do medo de cair em idosos que vivem na comunidade. O objetivo do presente estudo foi investigar os fatores associados que predizem o medo de cair em idosos, classificados segundo a CIF. **Materiais e Métodos:** Foram coletados dados de 340 adultos com 65 anos ou mais. O medo de cair foi avaliado por autorrelato. Os participantes foram avaliados quanto aos seus aspectos pessoais, estado de saúde, habilidades funcionais e perfil de participação social. Utilizou-se análise de regressão logística multivariada para determinar modelos preditivos do medo de cair. **Resultados:** A associação entre gênero (OR 2,77; IC 95% 1,62–4,72, p<0,001), velocidade da marcha (OR 0,19; IC 95% 0,09–0,42, p<0,001) e perfil de participação social (OR 2,35; IC 95% 1,39–3,95, p<0,001) compôs um modelo capaz de predizer até 64% (AUC = 0,794, p<0,001) do medo de cair em idosos. **Conclusão:** A associação dos preditores do medo de cair identifica que mulheres apresentam mais restrições na participação social e redução da velocidade da marcha, fatores que contribuem para o aumento do medo de cair em idosos.
Palavras-chave: Acidentes por Quedas; Envelhecimento; Percepção; Medo; Transtornos fóbicos

ABSTRACT

Objective: The International Classification of Function, Disability, and Health (ICF) may be an ideal comprehensive model for fall risk assessment. However, information associating ICF and fear of falling among community-dwelling older adults remains unclear. This study aimed to investigate the associated factors that predict the fear of falling in the older adults classified by the ICF. **Materials and Methods**: Data were collected from 340 community-dwelling older adults aged 65 years and older. They were assessed for their personal aspects, health status, functional skills, and social participation profile; the fear of falling was self-reported. Multivariate logistic regression analysis was used to determine prediction models for fear of falling. **Results**: Gender (OR 2.77; 95%CI 1.62 - 4.72, p < 0.001), walking speed (OR 0.19; 95%CI 0.09 - 042, p<0,001), and social participation (OR 2.35; 95%CI 1.39 - 3.95, p p<0,001), composed a model that may predict up to 64% (AUC = 0.794, p<0,001) of the fear of falling among community-dwelling older adults. **Conclusion**: The association of the predictors of fear of falling identified that women have more restriction on social participation and reduced walking speed as factors that contribute to increased fear of falling in community-dwelling older adults.
Keywords: Accidental Falls; Aging; Perception; Fear; Phobic Disorders.

RESUMEM

Objetivo: La Clasificación Internacional del Funcionamiento, de la Discapacidad y de la Salud (CIF) puede ser un modelo integral ideal para la evaluación del riesgo de caídas. Existe una falta de información que relacione la CIF con la evaluación del miedo a caer en adultos mayores que viven en la comunidad. El objetivo del presente estudio fue investigar los factores asociados que predicen el miedo a caer en adultos mayores, clasificados según la CIF. **Materiales y Métodos**: Se recopilaron datos de 340 adultos de 65 años o más. El miedo a caer fue evaluado por autoinforme. Los participantes

fueron evaluados en cuanto a sus aspectos personales, estado de salud, habilidades funcionales y perfil de participación social. Se utilizó un análisis de regresión logística multivariada para determinar modelos predictivos del miedo a caer. **Resultados:** La asociación entre género (OR 2,77; IC 95% 1,62–4,72, p<0,001), velocidad de la marcha (OR 0,19; IC 95% 0,09–0,42, p<0,001) y perfil de participación social (OR 2,35; IC 95% 1,39–3,95, p<0,001) conformó un modelo capaz de predecir hasta el 64% (AUC = 0,794, p<0,001) del miedo a caer en adultos mayores. **Conclusión**: La asociación de los predictores del miedo a caer indica que las mujeres presentan mayores restricciones en la participación social y una reducción en la velocidad de la marcha, factores que contribuyen al aumento del miedo a caer em adultos mayores.

Palabras clave: Accidentes por Caídas; Envejecimiento; Percepción; Miedo; Trastornos fóbicos.

INTRODUCTION

Falls and fall-related injuries are major health problems among older adults[1]. About a third of community-dwelling persons aged 65 years or older fall every year[2]. Falls can lead to minor injuries such as bruises, lacerations, or abrasions, and 10% of the cases result in fractures[3], thus contributing to significant increases in morbidity and mortality 1. Direct health care costs associated with this phenomenon are high[4], reaching 25 billion euros per year in the European Union only[5].

Falls are complex and have multifactorial etiologies[6]. Different factors can increase the risk of falling, particularly psychotropic medications and polypharmacy, and mitigation of these factors was found to reduce fall rates[7]. Environmental hazards at home related to lighting, chair and bed height, floor surfaces, and other factors create opportunities for falls and have been included as essential components of fall prevention programs[8]. Additionally, changes in musculoskeletal and sensory system functions that are associated with aging lead to deficits in maintaining postural stability[2]. Therefore, fear of falling (FoF) can have a major impact on older adults, raising caution and restricting activities that in turn leads to physical fragility[9].

The FoF is a multidimensional phenomenon, influenced by physical, psychological, social and functional factors[10]. Several characteristics are related to fear: being female[11,12], older[13], having poor perception of own's health[14], higher dependence in the activities of daily living[15,16], reduced muscle strength[15,17], impaired balance[11,12], and previous history of falls[16].

In this context, the International Classification of Functioning, Disability and Health (ICF), proposed by the World Health Organization, provides a comprehensive biopsychosocial framework to understand the complexity of FoF and falls[18]. The ICF considers functioning and disability as multidimensionais phenomena, including body structures and functions, activities, participation, and contextual factors (environmental and personal)[19]. When applied to fall-related research, the ICF enables the identification of how physical impairments (e.g., balance and muscle strength), activity limitations (e.g., mobility restrictions), participation restrictions (e.g., social withdrawal), and environmental barriers (e.g., unsafe housing conditions) interact to influence fall risk and FoF[20,21].

Moreover, the ICF framework highlights that FoF is not only a psychological condition but also a determinant of functional decline, since it may restrict activities of daily living, exacerbate dependency, and accelerate frailty[21]. Incorporating the ICF perspective strengthens the understanding that falls and FoF are not isolated clinical events, but health conditions influenced by the interaction of biological,

social, and environmental determinants. This perspective is essential to guide therapeutic strategies and public health interventions aimed at prevention and rehabilitation[18,19].

The fear of falling (FOF) is reported as one of the main predictors of falls[22-25]. It is as important as impaired balance[26] or, even more important than having had previous falls, since it is expressed even by older adults who have never fell[1,27]. Kabeshova and colleagues[28] did a study with 1,760 participants, divided into elderly with an isolated fall and those with recurrent falls. They analysed, in addition to physical factors, health conditions, personal and social factors, in order to identify, among them, which are the main risk factors for falls. These authors noted that in both study groups the fear of falling was the main predictor and it was strongly associated with falling events[28]. Twenty years before, Lachman and colleagues[29] had already suggested the important role of fear of falling on suffering falls.

Previous studies have indicated some factors that predict the fear of falling[12]. These include demographic characteristics, health status and functional abilities[14]. However, there is still no consensus on which associated factors can be addressed to reduce the incidence of falling due to fear of falling. Therefore, this study aims to identify which risk factors favor the prediction of fear of falling in the elderly, bringing elements to elaborate a therapeutic strategy to reduce fear of falling in older adults and ultimately reduce the actual fallings.

MATERIALS AND METHODS

Study Design

This study is a cross-sectional study, following a convenience sampling method. Ethical approval was obtained from the Research Ethics Committee of Polytechnic Institute of Coimbra (Nº6/2017). All participants will give written informed consent before data collection begins as per the Declaration of Helsinki.

Setting and individuals

Individuals were voluntarily recruited from several settings within the community in different regions of continental Portugal, such as parish councils, physical therapy clinics, seniors' universities, and other facilities.

The study included adults aged 65 years or over, able to stand and walk independently with or without walking aids, and who volunteered to participate in the study; body mass index (BMI) < 30 kg/m2[30]; preserved cognition (Mini-Mental State Examination >24)[31] and >14 points considering the participants the educational level, with illiterate participants[32].

Individuals who presented severe sensory impairment (deafness or blindness) or cognitive impairment, or impaired ability to understand the questionnaires and functional tests included in the screening protocol were excluded.

Initially, 370 older adults were recruited. Of these, 30 were excluded for not meeting the eligibility criteria: 12 due to BMI ≥30 kg/m², 9 for cognitive impairment (MMSE <24 adjusted for education), and 9 for severe sensory deficits (hearing or visual impairments that prevented test performance). Therefore, the final sample comprised 340 participants, who fulfilled all

inclusion criteria and were included in the analyses.

Procedure

The evaluation protocol occurred according to the FallSensing screening tool 33.

Fear of Falling

FoF is defined as "a lasting concern about falling that leads to an individual avoiding activities that he or she remains capable of performing"[34]. Considering the negative influence of FoF, we used by self-report through the question "Are you afraid of falling? Yes-No."

History of Falls

A fall can be defined as "an unexpected event, in which the participant comes to rest on the ground, floor, or lower level" and "excludes coming to rest against furniture, wall, or other structure"[35]. HoF within the previous 12 months was be determined by self-report, answering the question "Did you fall in the past 12 months? Yes-No."

Living Settings

Because FoF is more frequent among older adults living alone[36], this protocol intends to assess the living settings through the question "Do you live alone? Yes-No."

Sedentary Behavior

To understand the community-dwelling adults' sedentary behaviors using a self-reported question, we adopted the estimate measure of sedentariness calculated by Heseltine et al (2015), which is as follows: "Do you spend over 4 hours seated, 5 days or more per week?" This measure resulted from the analyses of sedentary behavior of a sample of 1104 adults aged 65 or more years, who answered the Physical Activity Scale for the Elderl[37].

Polypharmacy

The number of medicines taken by each person was assessed by self-report through the question "Do you take 4 or more different medicines per day? Yes-No." The names of the medicines were also registered, and they were identified according to their pharmaceutical group (benzodiazepines, antidepressants, antipsychotics, antiinflammatory drugs, antihypertensive drugs, and others drugs).

Functional Tests

Grip Strength

A Jamar (NC 701/142 model), hydraulic hand dynamometer was be settled at the second handle position held with the dominant hand and during the performance of the test, it was be presented vertically in line with the forearm. The test is performed only once and the participant was encouraged to exert his or her maximal grip strength for 5 seconds. The final score was measured in kilograms force (kgf)[38].

Timed Up and Go

The TUG test is used to assess dynamic balance during gait and transfers tasks, mobility, and lower body strength[39]. To perform this test, the person, wearing his or her regular footwear, was instructed to sit on a standard chair (chair height between 44 and 47 cm) with his or her back against the chair back. The person then stands up and walks straight for 3 meters as fast as possible, turns around, walks back, and sits down. The person must stand up without help (cannot use the upper extremities for support); however, if a walking aid is needed, it should be placed next to the chair and can be used to perform the gait component of the test. The test is performed only one time, the timing begins at

the instruction "go" and stops when the patient sits on the chair[39].

30 seconds Sit to Stand

The 30s STS test is a simple and effective instrument for assessing lower body strength and identifying muscle weakness in community-dwelling older adults and is one of the most important clinical functional evaluation tests 40. The person was instructed to perform cycles of sit and stand up from a chair as many times as possible over 30 seconds[40].

The person starts the test seated in the middle of the chair (chair height between 40 and 43.3 cm), feet approximately shoulder-width apart and placed on the floor, and arms crossed by the wrists placed against the chest. The vocal instruction "go" indicates the test´s beginning and if the participant completes more than halfway up at the end of 30 seconds, it is counted as a full stand. The final score involves recording the number of stands a person can complete in 30 seconds[40].

Step Test

The step test was designed to assess dynamic standing balance and reproduce lower extremity motor control and coordination. To perform the test, the person was asked to step on and off a block (7.5 cm height, 55 cm width, and 35 cm depth) placed against a wall as many times as possible for 15 seconds. The person should step onto the block with the whole foot and then return fully to the ground. The total number of completed steps in 15 seconds is recorded[41].

4-Stage Balance Test "Modified"

The 4-Stage Balance test "modified" evaluates balance. To complete this test, the person needs to progressively accomplish the following 4 different feet positions: side by side stance, semitandem stance (preferred foot forward with the instep of one foot touching the big toe of the other foot), tandem stance (one foot in front of the other, heel touching toe), and one legged stance (preferred leg for support)[42].

The person was instructed to stand quietly on the pressure platform, arms along the body, with neither shoes nor assistive devices. The positions must be held for 10 seconds each without moving the feet, needing support, losing balance or touching the leg of support with the other leg and must be performed with eyes open and then closed (excluding one legged stance position). The sequence was be side by side stance eyes open, side by side stance eyes closed, semitandem stance eyes open, semitandem stance eyes closed, tandem stance eyes open, tandem stance eyes closed, and one leg stand eyes open. If the person fails to accomplish one of the test positions, the test finishes. The final score will be the number of positions that are completed[42].

10-Meter Walking Speed

The performance of this test requires a 20-meter straight path with 5 meters for acceleration, 10 m for steady-state walking, and 5 meters for deceleration. Markers are placed at the 0-, 5-, 15-, and 20-meter positions of the path, and the time to walk along the 5 and 15 meters is registered. The person was instructed to walk at his or her fastest walking speed wearing typical footwear and without running along the 20-meter path; an assistive device can be used if needed[43].

Questionnaires

Self-Efficacy for Exercise

Self-efficacy reflects the confidence that a person has to perform a certain behavior[33]. The self-efficacy for exercise is a 5-item scale intended to analyze the confidence that a person has to perform exercise according to 5 different emotional states, such as feeling worried or having problems, feeling depressed, feeling tired, feeling tense, and being busy. Ratings were made using a 5-point Likert scale from 1 "not at all true" to 4 "completely true." In between are 2, meaning "slightly true," and 3, meaning "moderately true"[33].

Activities and Participation Profile Related to Mobility

PAPM is an 18-item scale intended to improve the understanding of the difficulties individual experiences while performing certain daily activities in their natural environment. These activities can be conditioned by mobility and are related to the interactions and social relations, education, employment, money management, and social and community life and influence a person's active participation in society. Ratings were made using a 5-point Likert scale from 0, meaning "no limitation or restriction," to 4, meaning "complete limitation or restriction." In between, 1 indicates "mild limitation or restriction," 2 indicates "moderate limitation or restriction," and 3 indicates "severe limitation or restriction." Because some activities may not apply, not all activities may be rated. As a result, an individual's participation profile was to be produced[44].

Home Safety Checklist for Fall Prevention

The Home Safety Checklist for Fall Prevention is a 38-item scale intended to identify home hazards in each room of a person's home, namely the hallways, stairs, living or dining room, kitchen, bathroom, bedroom, and outdoors. Ratings are assigned using a 3-point scale from 0 (indicating "no risk"), 1 (indicating "risk"), to 99 (indicating "do not apply"). A risk score is produced both to each room and for the home in general[44].

Statistical analysis

Statistical analysis was performed with SPSS Statistics version 23.0 (IBM, Chicago, USA). To assess the normal distribution the Shapiro-Wilk test was used. Differences in the FOF by individual characteristics were identified using the chi-square test, t-test or Mann-Whitney test. Factors statistically significantly associated with fall in the univariate analysis were included in multivariable regression model. The stepwise selection method for logistic regression model was used to identify the FOF risk factors. Odds ratios (ORs) and corresponding 95% confidence intervals (CIs) were calculated for logistic regression. The level of statistical significance was set at less than 0.05.

RESULTS

This study included 340 individuals. Table 1 shows the association between fear of falling in older adults and demographics, health status, fall risk functional abilities.

Table 1. Association between fear of falling in older adults and demographics, health status, environmental fall risk and functional abilities.

	Total (n=340) Mean (SD) or *n* (%)	FOF (n=179) Mean (SD) or *n* (%)	Non-FOF (n=161) Mean (SD) or *n* (%)	OR (95% CI)	*p* value
Age (years)	74.93 (6.7)	75.95 (7.1)	73.80 (5.9)	1.05 (1.02 – 1.09)	**0.003**[a]
Gender					**<0.001**[c]
Female	222 (65.3)	143 (42.1)	79 (23.2)	4.12 (2.55 – 6.54)	
Male	118 (34.7)	36 (10.6)	82 (24.1)	1	
Living Settings (alone)					**0.046** [c]
Yes	120 (35.3)	72 (21.2)	48 (14.1)	1.58 (1.01 – 2.49)	
No	220 (64.7)	107 (31.5)	113 (33.2)	1	
BMI (kg/m²)	27.91 (4.3)	28.26 (4.7)	27.53 (3.7)	1.04 (0.99 – 1.090	0.116[a]
Physical Activity					**0.020** [c]
Active	178 (52.4)	83 (24.4)	95 (27.94)	1	
Sedentary	162 (47.6)	96 (28.2)	66 (19.41)	1.66 (1.08 – 2.56)	
Self-Efficacy for Exercise	14.07 (4.6)	13.11 (4.7)	15.11 (4.2)	0.91 (0.86 – 0.95)	**<0.001**[a]
Polypharmacy					**<0.001** [c]
Yes	230 (67.7)	138 (40.6)	92 (27.1)	2.52 (1.58 – 4.03)	
No	110 (32.4)	41 (12.1)	69 (20.3)	1	
History of Fall					**0.012** [c]
Yes	116 (34.1)	72 (21.2)	44 (12.9)	1.80 (1.13 – 2.82)	
No	224 (65.9)	107 (31.5)	117 (34.4)	1	
Environmental risk index (score)	22.73 (10.3)	23.87 (10.7)	21.46 (9.6)	1.02 (1.00 – 1.05)	**0.031**[a]
PAPM (score)	0.52 (0.8)	0.80 (0.5)	0.21 (0.3)	4.50 (2.73 – 7.41)	**<0.001**[a]
Grip Strength (kg/F)	22.36 (8.3)	19.51 (6.3)	25.52 (9.2)	0.90 (0.88 – 0.93)	**<0.001**[a]
30 seconds Sit to Stand (score)	10.26 (3.7)	9.08 (3.5)	11.44 (3.5)	0.82 (0.77 – 0.88)	**<0.001**[a]
Timed UpGo (s)	11.17 (8.2)	13.51 (10.2)	8.72 (4.6)	1.15 (1.08 – 1.22)	**<0.001**[a]
4-Stage Balance Test (score)	5.00 (0.07)	5.00 (1.4)	5.00 (1.2)	0.94 (0.91 – 1.12)	0.056[b]
Step Test (score)	10.35 (4.2)	8.86 (3.7)	11.90 (4.0)	0.82 (0.77 – 0.87)	**<0.001**[a]
10-Meter Walking Speed (m/s)	1.35 (0.5)	1.16 (0.4)	1.57 (0.4)	0.08 (0.04 – 0.16)	**<0.001**[a]

Note: SD, standard deviation; n, sample; kg, kilogram; m, meters; BMI, Body Mass Index; kg/m2, kilogram/square meters; m/s, meters/seconds; PAPM, Activities and Participation Profile Related to Mobility. [a] Student's T-Test; [b] Mann-Whitney; [c] Chi-squared.

The multivariate analysis revealed gender, walking speed, social participation profile as predictors for the FOF level (table 2).

Table 2. Gender, walking speed, activities and participation profile as predictors of the level of fear of falling in older adults.

Variables	β value	*p* value	OR (Beta coefficient)	95% Confidence Limits
Gender (Female)	1.018	<0.001	2.77	1.62 – 4.72
PAPM (higher score)	0.853	0.001	2.35	1.39 – 3.95
10-Meter Walking Speed (m/s);	-1.614	<0.001	0.19	0.09 – 0.42
Constant	1.281	0.040	3.59	

Note: Nagellerke R square- 0.64. Cox and Snell R-0.47. PAPM - Activities and Participation Profile Related to Mobility; g(x) = (1.018* gender) + (0.853* PAPM) + (-1.614* MWS) + 1.281 =; 1 / [1+e-g(x)] = FOF percentage.

The predictive performance of the constructed model presented AUC = 0.794 (p <0.001). This model predicted FOF with a sensitivity of 75.16%, specificity of 70.16%, positive and negative predictive values of 89.18% and 88.54%, respectively. The cut-off value of the model was ≤0.35.

DISCUSSION

This study, based on the ICF framework, related FOF with body functional abilities, social participation profile (PAPM), personal and environmental factors. The association of the predictors of FOF identifies that being a woman with restrictions on social activities performance and reduced walking speed as factors that contribute to increased FOF in older adults. The combination of these three factors can predict up to 64% of FOF in this population.

The findings of the present study highlighted that both modifiable and non-modifiable factors associate with FOF: age[13], gender[11], living alone[45], physical inactivity[17], polypharmacy[46], falls in the previous year[17,47], lower self-efficacy to exercise[48], environmental risk[49], muscle strength[15], balance[26,47], agility and motor coordination 26,50; have been widely reported as risk factors for FOF in previous studies, as well as the findings of this study (Table 1). Finding a range of changeable factors related to FOF offers several points that can incorporate various prevention strategies. At the same time, it emphasizes the difficulty of intervening under a multifactorial phenomenon.

All risk factors for falls previously described were analyzed in this study,[15,16,46,50,51]. However, multivariate logistic regression highlighted that our prediction model only included gender, gait speed, and social participation profile as being predicting factors for FOF (Table 2). Such a model can explain a considerable percentage of the FOF, as well as provide objective means for developing evaluation tools and therapies.

This study demonstrated that being female is a risk factor for FOF. This may be explained by the fact that greater fragility and consequent fall rates are higher in women, and the experience of falling may increase the FOF[52]. Thus, being a

woman becomes one of the most problematic risk factors, as it is a non-modifiable factor.

Walking speed was identified in this study as a protective factor against the FOF. For Fritz and colleagues.[53], this factor was considered the sixth vital sign, and there is a consensus that it represents the best variable of functioning in the elderly. Thus, the study highlights gait speed as one of the factors that should be incorporated in future strategies to prevent FOF.

The Activities and Participation Profile Related to Mobility score was the last variable that made up the FOF prediction model and is associated with the female gender and gait speed variables. It is already known that the greater dependence on activities of daily living is associated with the FOF in the elderly[26,52]. Thus, PAPM ended up composing the prediction model because it reflects not only the functional aspect but also how much and which activities of daily routines are restricted.

A differential of this study from others[46,48,50,52,53] is that it evaluated the social participation profile that is under the influence of functional abilities, a factor this study has shown to be associated with FOF. Previously, Auals and colleagues[54] indicated that any approach aimed at intervening on FOF, such as fall prevention strategies, should also be extended to participation in daily routines, as recommended by the ICF. Our findings differ from those described in previous studies that reported functional improvements according to scores or averages in separate assessments of balance, muscle strength, and other functional variables[26,53,55].

Our study has limitations regarding its sample size and design. The latter did not allow us to investigate causal relationships. However, the modifiable factors here identified, which are performance of activities of daily living and gait speed, may help developing new therapeutic strategies to reduce FOF and, consequently, the events of falls in the elderly. As noted earlier, these variables can predict up to 64% of the FOF, so strategies that are directed by them may have a more satisfactory outcome than that currently achieved with cognitive strategies only [56,57]. Likewise, the systematic review and meta-analysis by Kumar and colleagues 58, showed that not all exercise intervention strategies can modify the FOF in the elderly. Thus, our findings may contribute to directing development of new strategies that are based on exercise and movement.

Further studies should do a longitudinal study to identify the causal factors of FOF and to validate a therapeutic program aimed at preventing and/or controlling FOF in older adults. The association of factors such as being a female, restricted social participation and reduced walking speed stood out as the combination with the highest percentage of prediction of FOF in the participants of this study. The FOF prediction model can be studied to prevent falls, highlights important domains of according to the ICF human function.

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AUTHOR CONTRIBUITIONS

GB: Conceptualized the study, analyzed and interpreted the data, and wrote the manuscript. **RM**: Analyzed the data and critically revised the manuscript for important intellectual content. **AC**: Contributed to the study's concept and design, supervised the research, and critically revised the manuscript for significant intellectual content.

CONFLICT OF INTEREST

The authors declare that this research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

USE OF GENERATIVE ARTIFICIAL INTELLIGENCE

The authors declare that they have not used generative AI of any kind.

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