Relationship between depressive symptoms and functionality: impacts on the functional capacity in older adults

A relação entre sintomas depressivos e funcionalidade: impactos na capacidade funcional da população idosa

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Abstract

Objective: To identify the presence of depressive symptoms in a sample of older adults and its relationship with functionality, in addition to protective factors against functional decline. **Methods**: A descriptive cross-sectional study was conducted with older adults attending a teaching clinic in Olinda (Pernambuco, Brazil) from August 2023 to April 2024. Depressive symptoms were assessed using the Simplified Geriatric Depression Scale (GDS-15). Activities of daily living were assessed using the Katz Index and the Lawton-Brody Instrumental Activities of Daily Living scale. Associations were verified using logistic regression with the generalized linear model and variable selection using the Stepwise method. All data was analyzed using R statistical software. **Results**: Most participants were between 60 and 70 years old (87.1%). Women accounted for 65% of partially dependent participant and the one completely dependent participant. A positive correlation was observed between depressive symptoms and functional decline in partially dependent participants (odds ratio [OR] = 6.05) and those with mild (OR = 4.62) or moderate dependence (OR = 4.94). Furthermore, employment was observed as a protective factor against functional decline in older adults with mild dependence. **Conclusion:** Depressive symptoms increased the likelihood of functional decline in older adults, while employ-

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ment contributed to quality of life. Recognizing factors influencing functional decline is essential for strengthening strategies that improve functionality within this population.

Key words: Depression; Protective factors; Elderly; Elderly health; Dependent elderly.

Resumo

Objetivo: Identificar a ocorrência de sintomas depressivos e sua relação com a capacidade funcional, além de fatores protetores do declínio funcional da pessoa idosa. **Métodos:** Trata-se de pesquisa quantitativa e descritiva, do tipo transversal, realizada com população idosa atendida em clínica escola do município de Olinda (PE) no período de 08/2023 a 04/2024. Para análise dos sintomas depressivos, utilizou-se a Escala de Depressão Geriátrica Simplificada (GDS-15). A escala de Katz auxiliou na análise das Atividades Básicas da Vida Diária (ABVD), e Lawton e Brody para Atividades Instrumentais da Vida Diária (AIVD). Foram verificadas associações por meio da metodologia de regressão logística utilizando o *software* estatístico R e função glm. Na seleção das variáveis utilizou-se o método *Stepwise*. **Resultados:** A maioria dos participantes possui entre 60 e 70 anos, correspondendo a 87,1%. O sexo feminino prevaleceu em todas as categorias, sendo 65,4% parcialmente dependentes e 100% totalmente dependentes. Houve correlação positiva entre presença de sintomas depressivos e perda de funcionalidade pelas escalas de Katz e de Lawton e Brody, com *Odds Ratio* de 6,05 para parcialmente dependente, 4,62 na dependência leve e 4,94 na dependência moderada. Ademais, na dependência leve, verificou-se a ocupação como fator protetor no comprometimento funcional na pessoa idosa. **Conclusão:** Nota-se que os sintomas depressivos aumentam a chance de declínio funcional entre a população idosa, e a atividade laboral auxilia na preservação da qualidade de vida dessa população. Assim é fundamental reconhecer esses dados e fortalecer estratégias que promovam melhorias da funcionalidade dessa população.

Palavras-chave: Depressão; Fatores de proteção; Idoso dependente; Pessoa idosa; Saúde do idoso.

INTRODUCTION

In Brazil, the National Health Policy for Elderly People (Política Nacional de Saúde da Pessoa Idosa) and the Statute of the Elderly establish that individuals aged 60 or older are entitled to specific rights. These policies aim to ensure autonomy, respect, and the well-being of older adults, promoting dignified aging and quality of life[1,2]

Over the past decades, the proportion of older adults within the population pyramid has increased markedly. In this scenario, society and the State must be prepared to address the specific demands arising from this demographic shift, which is expected to represent a relevant portion of the population in the next years. Projections from the Brazilian Institute of Geography and Statistics estimate that approximately 13.5% of the national population will be aged 60 or older by 2030.

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A projection of 13.2% is estimated in the state of Pernambuco (PE). Therefore, studies focused on older adults are crucial to identifying health-related vulnerabilities and informing strategies aimed at their prevention and care[3].

Aging is associated with physiological and psycho-emotional changes that impact the lives of older adults. Therefore, well-being assessment should consider physical activity, nutritional status, functional capacity, interpersonal relationships, and mental health information. In this sense, healthy aging is achieved through a balance among these elements.[4]

Chronic non-communicable diseases represent a group of conditions with diverse etiologies and biological and behavioral risk factors characterized by slow progression and long duration. These diseases are highly prevalent among older adults and may contribute to functional decline[5].

Depressive disorders have become increasingly common among older adults. This phenomenon may be attributed to pathophysiological or social changes that decrease quality of life. Furthermore, depression may be presented atypically in older adults, challenging clinical diagnosis. For example, symptoms such as anhedonia or sleep disturbances, traditionally considered essential for diagnosis according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), may be absent during the clinical assessment of this population.[6,7]

Standardized instruments to evaluate functional capacity and depressive symptoms in older adults are crucial. Furthermore, its use allows understanding of the challenges faced by this population in relation to loss of autonomy, increased dependence on daily activities, and emotional difficulties.[8,9]

The physical functionality in older adults may be compromised by limitations in both basic activities, such as dressing, and more complex tasks, such as managing finances. Additionally, older adults may experience sadness, isolation, or loss of purpose, which can prompt depressive episodes. In this context, the Katz[9], Lawton-Brody[9], scales are used to assess the ability of older adults to perform basic and instrumental activities of daily living. The Simplified Geriatric Depression Scale (GDS-15) is also applied to identify symptoms of depression.

Thus, this study investigated the impact of depression on the functionality of older adults. Moreover, we aimed to identify protective factors against depression in this population. Our results may contribute to public health policies and inform health practices focused on maintaining the functionality of older adults.

METHODS

A quantitative, descriptive, and cross-sectional study was conducted using a convenience sample of older adults attending outpatient services at a university clinic in the municipality of Olinda (PE, Brazil). Data was collected between August 2023 and April 2024.

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Eligibility criteria included individuals aged 60 years or older, of both genders, who expressed interest in participating in the study and demonstrated preserved cognitive ability to comprehend the questions assessed by the scales. Individuals out of the specified age range or those with a prior diagnosis of cognitive-impairing diseases were not eligible.

The convenience sampling method was non-probabilistic, according to the service demand. Data were collected through direct contact with eligible individuals and interviews conducted by trained researchers. First, participants completed a sociodemographic questionnaire that included age, gender, religion, race or ethnicity, employment status, retirement status, monthly income, physical activity, and number of people living in the household. Second, the Katz Index, the Lawton-Brody Instrumental Activities of Daily Living Scale (IADL), and GDS-15[9] were administered.

The Katz Index assesses ADL and evaluates six activities: bathing, dressing, personal hygiene, mobility, continence, and feeding. Each task performed independently scored one point. Total scores were interpreted as follows: severe dependence (0 points), partial dependence (1 to 5 points), or full independence (6 points)[9,10]

The IADL covers nine domains: telephone use, shopping, meal preparation, housekeeping, handyman tasks, laundry, transportation, medication management, and financial responsibility.

For each item, responses were scored on a three-point scale: no assistance needed (3 points), partial assistance needed (2 points), or full assistance needed (1 point). Total scores were classified as completely dependent (≤ 9 points), severely dependent (between 10 and 15 points), moderately dependent (between 16 and 20 points), mildly dependent (between 21 and 25 points), and independent (between 26 and 27 points) for IADL performance.[9,11]

Potential depressive symptoms were assessed using the GDS-15. This instrument consists of 15 "yes" or "no" questions, with one point assigned for each depressive response. A score of 5 points or below suggests a positive screening for depression.[9,12]

Analyses were conducted using R studio team (2020) software. Binomial and multinomial logistic regression models were applied using the generalized linear models (GLM) framework. This approach allowed fitting the multinomial logistic regression model to the data, examining the relationships between independent variables and the primary dependent variable, while accounting for the functional classification of older adults.

Variable selection was performed using the Stepwise method. The first step of this iterative process began with an initial model, from which variables were systematically added or removed based on the reduction of the Akaike information criterion. The method may be implemented through either forward selection (beginning with no variables) or backward elimination (starting with all variables). The Akaike information criterion was calculated at each step to evaluate and

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adjust the model, incorporating a penalty for complexity to avoid overfitting. The iterative process continued until no further model improvement could be made, resulting in a balanced model suitable for interpretation and statistical inference.

The study protocol was approved by the research ethics committee of the Olinda Medical School (n°69879923.5.0000.8033) and followed the guidelines established by resolution 466/2012 of the Brazilian national health council for research involving human beings[13]

RESULTS

A sample of 210 older adults was included in this study. Most participants were between 60 and 70 years old (n = 183). Within this age range, 58.5% were classified as independent and 57.7% as partially dependent, with no cases of complete dependence recorded. Among participants aged between 70 to 80 years, 36.1% were classified as independent, 38.5% were partially dependent, with no cases of complete dependence recorded. Among participants aged between 80 to 90 years, 5.5% were classified as independent, 3.8% as partially dependent, and one participant was completely dependent. These findings suggest an increasing trend toward functional dependence with advancing age, consistent with existing literature on the aging process and its impacts on autonomy and functionality among older adults (Table 1).

Women predominated across all dependence categories, accounting for 72.1% of independent participants, 65.4% of partially dependent participants, and the one completely dependent participant. Men represented 27.9% of independent participants and 34.6% of the dependent participants.

Most participants self-identified as mixed-race (51.4% independent and 53.8% partially dependent). Around 25.1% of independent participants and 53.8% of partially dependent participants reported being white. Black ethnicity was reported by 20.8% of independent participants, 7.7% of partially dependent participants, and the one completely dependent participant. Asian and indigenous ethnicities accounted for 2.2% and 0.5% of independent participants. These findings highlight distinct gender and racial or ethnic patterns across dependence categories (Table 1).

Tabla 1. Katz Index scores and their association with sociodemographic characteristics, Olinda (PE), Brazil, 2024.

	Independent		Partially dependent		Completly dependent	
Age (in years)	**N**	**%**	**N**	**%**	**N**	**%**
60 to 70	107	58,5	15	57,7	0	0
70 to 80	66	36,1	10	38,5	0	0
80 to 90	10	5,5	1	3,8	1	100

Gender

Female	132	72,1	17	65,4	1	100
Male	51	27,9	9	34,6	0	0
Race/Ethnicity						
Asian	4	2,2	1	3,8	0	0
White	46	25,1	14	53,8	0	0
Indigenous	1	0,5	0	0	0	0
Mixed-race	94	51,4	14	53,8	0	0
Black	38	20,8	2	7,7	1	0
Employmente						
Yes	25	13,7	3	11,5	0	0
No	158	86,3	23	88,5	1	100
Retirement						
Yes	138	75,4	20	76,9	1	100
No	45	24,6	6	23,1	0	0
Income (in minimum wage)						
Less than 1	36	19,7	7	26,9	0	0
1 - 1.5	112	61,2	15	57,7	1	100
1.5 - 2	13	7,1	0	0	0	0
2 - 2.5	13	7,1	2	7,7	0	0
2.5 or more	9	4,9	7	26,9	0	0
Physical activities						
Yes	66	36,1	6	24,0	0	0
No	117	63,9	19	76,0	1	100
Living alone						
Yes	144	78,7	21	80,8	1	100
No	39	21,3	5	19,2	0	0
Religion						
Catholic	98	53,6	14	53,8	1	100
Christian	3	1,6	0	0	0	0
Spiritist	8	4,4	0	0	0	0
Mormon	1	0,5	0	0	0	0
Protestant	63	34,4	11	42,3	0	0
No religion	10	5,5	1	3,8	0	0

The Katz index classification system categorizes functionality as completely dependent (6 points), partially dependent (between 1 and 5 points), or independent (0 points). The total score ranges from 0 to 6 points. Low scores indicate enhanced dependence level in ADL.

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Around 86.3% of the independent participants were unemployed. Similar was found in 88.5% of the partially dependent participants and the completely dependent participant. A total of 13.7% of the independent and 11.5% of the partially dependent participants reported being employed.

A total of 75.4% of the independent, 76.9% of the partially dependent, and the one completely dependent participant were retired. Most participants reported earning between 1 and 1.5 minimum wages, representing 61.2% of independent participants, 57.7% of partially dependent participants, and the completely dependent participant. Other income brackets had low representation, with a progressive decline observed at higher income levels. No participants reporting earning between 1.5 and 2 minimum wages were classified as partially or completely dependent. These results highlight distinct socioeconomic patterns across different dependence levels (Table 1).

No significant associations were found between age group, gender, race or ethnicity, income, and employment status with ADL ($p > 0.05$; Table 2).

Table 2. Statistical analysis of the sociodemographic characteristics and GDS-15 scale examined according to significance the Katz index – Olinda (PE), Brazil, 2024.

	Estimate	Standard deviation	p-value	OR	Confiance interval
70 to 80	0,323	0,6	0,59729	1,38	0,49 – 3,9
80 to 90	- 0,899	1,3	0,49678	0,41	0,04 – 3,87
Male	0,483	0,6	0,40567	1,62	0,6 – 4,35
Race (White)	0,009	1,5	0,99529	1,01	0,08 – 12,11
Race (Indigenous)	- 15,140	4,548	0,99735		
Race (Mixed-race)	- 0,368	1,4	0,79589	0,69	0,06 – 7,82
Rece (Black)	- 1,350	1,6	0,40117	0,26	0,02 – 4
Employed	0,053	0,9	0,95422	1,05	0,22 – 5,04
Retired	0,996	1,1	0,37403	2,71	0,4 – 18,21
Income < 1 minimum wage	1,413	1,1	0,20957	4,11	0,61 – 27,85
Income berween 1 and 1.5 minimum wage	- 14,950	1,173	0,98985		
Income berween 2 and 2.5 minimum wage	0,556	1,1	0,59999	1,74	0,29 – 10,82

Income > 2.5 minimum wage	0,896	1,1	0,41467	2,45	0,38 – 15,89
Living alone (Yes)	0,219	0,7	0,74923	1,25	0,39 – 4
Positive in GDS-15	2,113	0,7	0,00179	8,28	2,65 – 25,83

GDS-15: Geriatric Depression Scale (Short Form) ranges from 0 to 15. Scores ≥ 5 suggest depressive symptoms prevalence. Katz classification: total dependence (0 points), partial dependence (1 to 5 points), independence (6 points). Katz score: ranges from 0 to 6. Low scores indicate greater dependence in ADL. LL: lower limit; UL: upper limit; OR: odds ratio.

A significant association was observed between the Katz Index and the screening for depressive symptoms (p < 0.05). Older adults with positive GDS-15 scores showed increased risk for being partially dependent in ADL (OR = 6.05; Table 3).

Table 3. Statistical Analysis Between Positive GDS-15 and Katz Index Scores (Olinda, Pernambuco, Brazil, 2024)

Variables	Estimate	Standard deviation	p-value	*Odds Ratio*
Positive GDS-15 x Partially dependent Katz	1,799	0,51	0,0005	6,05

GDS-15: Geriatric Depression Scale (Short Form) ranges from 0 to 15. Scores ≥ 5 suggest depressive symptoms prevalence. Katz classification: total dependence (0 points), partial dependence (1 to 5 points), independence (6 points). Katz score: ranges from 0 to 6. Low scores indicate greater dependence in ADL.

Among independent participants, 68.2% did not have depressive symptoms. Participants who were mildly dependent (66.7%), moderately dependent (68.8%), and severely dependent (100%) according to the IADL showed positive GDS results (Table 4).

Table 4. Lawton-Brody Instrumental Activities of Daily Living Scale in association with sociodemographic characteristics and GDS-15, Olinda (Pernambuco, Brazil), 2024.

IADL

	Independent		Mild Dependence		Moderate Dependence		Severe Dependence	
Physical activities	**N**	**%**	**N**	**%**	**N**	**%**	**N**	**%**
Yes	50	37,9	18	34,0	4	25,0	0	0
No	82	62,1	35	66,0	12	75,0	8	100

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Geriatric Depression Scale (GDS-15)							
Positive	42	31,8	36	66,7	11	68,8	8	100
Negative	90	68,2	18	33,3	5	31,3	0	0

GDS-15: Geriatric Depression Scale (Short Form) ranges from 0 to 15. Scores ≥ 5 suggest depressive symptoms. Lawton & Brody classification: total dependence (≤ 9 points), severe dependence (10 to 15 points), moderate dependence (16 to 20 points), mild dependence (21 to 25 points), and independence (26 to 27 points). Lawton & Brody score: ranges from 9 to 27 points. Low scores indicate increased dependence in IADL.

The GDS-15 identified symptoms including life dissatisfaction, sadness, discouragement, and lack of energy among participants. The GDS-15 results were analyzed together with the IADL to assess the impact of these symptoms on functionality. A significant correlation was observed between depressive symptoms and increased levels of dependence in IADL.

Participants with positive GDS-15 screening results were found to be approximately four times more likely to present mild or moderate dependence compared with those with negative screening results. Despite positive screening for depression, we did not analyze the OR for complete dependence due to the presence of only one participant in this category.

Employment status was identified as a significant protective factor (OR < 1; p = 0.021) against IADL decline among older adults with mild dependence, suggesting this is a protective effect (Table 5).

Table 5. Correlation between the Lawton-Brody Instrumental Activities of Daily Living Scale, GDS-15, and employment status. Olinda (Pernambuco, Brazil), 2024.

Lawton-Brody Instrumental Activities of Daily Living Scale		OR	95% CI	p-value
Mild dependence	**GDS-15 classification**			
	Negative	—	—	
	Positive	4,62	2,32 , 9,21	< 0,001
	Employment			
	Yes	0,21	0,06 , 0,79	0,021
	No	—	—	
Moderate dependence	**GDS-15 classification**			
	Negative	—	—	
	Positive	4,94	1,58 , 15,4	0,006
	Employment			
	Yes	0,32	0,04 , 2,64	0,3
	No	—	—	

	GDS-15 classification			
Severe dependence				
	Negative	—	—	
	Positive	—	—	< 0,001
	Employment			
	Yes	0	—	> 0,9
	No	—	—	

CI: confidence interval; GDS-15: Simplified Geriatric Depression Scale, ranging from 0 to 15. Scores ≥ 5 suggest depressive symptoms; Lawton & Brody classification: dependent (≤ 9 points), severe dependence (10 to 15 points), moderate dependence (16 to 20 points), mild dependence (21 to 25 points), and independent (26 to 27 points); Lawton & Brody score: ranges from 9 to 27, with lower scores indicating greater dependence in IADL; OR: odds ratio.

DISCUSSION

In this study, women predominated across all dependence categories in ADL (72.1%, 65.4%, and 100% among independent, partially dependent, and totally dependent, respectively). This pattern may be attributed to accelerated loss of bone and muscle mass among this population, particularly after menopause, which can contribute to increased functional decline.

In contrast, Tibães et al. (2021)[14] reported higher rates of complete dependence among men (8.2%) compared with women (7.8%), while women showed increased risk of instrumental functional decline (37.8%) compared with men (35.7%).

Our findings corroborate the study conducted by Araújo et al.[15], in which employment was identified as a protective factor against functional decline in both ADL and IADL. Among the participants reporting being employed, 89.2% were classified as independent according to the Katz Index, contrasting with 87% of unemployed participants. Similarly, the IADL showed 85.7% of the employed participants were independent versus 59.3% among those who were unemployed. These results underscore employment as a protective factor against mild functional dependence (OR = 0.21; p = 0.021).

Analysis of the IADL indicated that physically active participants had higher rates of independence (69.4%, n = 50) compared with sedentary individuals (59.8%, n = 82). These findings corroborate the findings described by Lopes[16] in the Recife metropolitan area (PE, Brazil). The authors observed improved balance and flexibility test scores among physically active older adults. Our results further reinforce the association between regular physical exercise and greater levels of independence, likely mediated by the maintenance of physical fitness in older adults.

The study identified positive screening for depressive symptoms in 46.2% (n = 97) of participants. This finding may be linked to the fact that most participants (approximately 95%; n

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= 199) reported practicing some religion, whereas only 5% (n = 11) reported no religious involvement. Mendes et al. (2021)[17] also observed a low prevalence of depression (27.3%) in their study population, with most participants reporting being part of social groups and religious communities.

We observed that 78.7% (n = 144) of independent older adults lived alone. This finding corroborated the study conducted by Aguiar et al. (2019)[18] with older adults living alone and reporting few experiences of functional decline.

A significant association was found between positive depression screening and decreased functionality in ADL. A total of 80.8% of partially dependent participants were screened positive on the GDS-15, suggesting that depressive symptoms negatively impact the quality of life of older adults by compromising functional abilities. Mendes et al. (2021)[17] also identified a significant correlation between the Katz Index and GDS-15 results. These findings indicate that depression is associated with decreased functional independence. Approximately 70.5% (n = 55) of participants with some degree of dependence on IADL also presented depressive symptoms. The analysis revealed a four-fold increase in the risk of functional decline among older adults with depressive symptoms, with OR of 4.62 and 4.94 for mild or moderate dependence, respectively. These findings reinforce the role of depression as a risk factor for functional impairment. Carvalho et al. (2023)[19] reported that most independent individuals did not present depression symptoms, endorsing the suggested association.

In the study by Freitas and Soares (2019)[20], most frail older adults (8.8%; n = 27) classified as having functional decline according to the Clinical-Functional Vulnerability Index-20 presented no depression risk according to the GDS-15, while only 7.9% (n = 24) showed depression risk. This pattern was not observed in this study. Additionally, Freitas and Soares (2019)[20] reported an age-related progression of dependence, especially among individuals aged over 80 years with mild (5.6%), moderate (18.8%), and severe (25%) dependence levels. This progression was accompanied by declines in functionality and income.

The study conducted by Jang et al. (2021)[21] identified a strong association between chronic diseases, functional disability, and negative health self-assessments among adults with depression aged over 60 years. Similarly, Read et al. (2017)[22] found that depression was correlated with multimorbidity (66.8%), indicating that depressive disorders are two- to three-fold more prevalent among individuals with multiple chronic conditions compared with those without chronic physical illnesses.

The results of the present study showed an association between depressive symptoms and functional decline in older adults, indicating that depression significantly increases the risk of functional decline in daily activities. Our findings corroborate the results of Gonçalves[23], in which older adults with depressive symptoms had approximately a four-fold increase in the likelihood of developing disability in ADL and a three-fold greater risk in IADL.

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Our findings emphasize the crucial role of mental health in preserving functional capacity and autonomy among older adults. Furthermore, interventions addressing the prevention and treatment of depression are essential to mitigate its negative impact on the functionality of this population.

CONCLUSION

This study emphasized that the health matters of older adults must be addressed by an integrated approach encompassing physical, mental, and social dimensions. The identification of employment as a protective factor for functional decline clarifies pathways for sustained quality of life maintenance in aging populations. Furthermore, physical activity, religious involvement, and social participation also seem relevant factors. We observed a significant association between depressive symptoms and increased risk of functional decline, highlighting the need for systematic screening and early intervention strategies for depression.

Our findings reinforce the need for public health policies fostering integrative and community-based practices. Such initiatives should aim to create supportive environments promoting healthy aging while acting as protective resources for preserving functional abilities among older adults.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

FUNDING

None.

AUTHOR CONTRIBUTIONS

APRC: development of ideas, formulation and development of research objectives, preparation and drafting the initial manuscript, methodology, and discussion, as well as critical review, commentary, references, and revision of the entire article; **LFO:** selection of ideas and redirection towards the research aims, assistance in drafting the introduction, objectives, results, discussion, and abstract sections; **AJPB:** formulation of research objectives, preparation of the initial manuscript draft, development of final considerations, references, and revision of the entire article; **KMRS**: definition of the central ideas of the project and selection of the main and specific objectives. Additionally, participated in researching studies that served as references and in the development of sections of the work, particularly the introduction, results, discussion, and abstract; **SCAP:** guidance and supervision of the article construction and research activity, critical review, commentary, and validation of pre-publication information; **DMFS:** supervision, planning

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and executing the research, external guidance to the research team, methodology, verification of research results and data, manuscript revision, and writing guidance. All authors read and approved the published version of the manuscript.

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