Original Article

Trauma in elderly people assisted by the mobile emergency care service

Trauma em idosos socorridos pelo serviço de atendimento móvel de urgência

Lesiones en adultos mayores socorridos por el servicio de atención móvil de urgencia

Danielle Braga Pena Franck[1] https://orcid.org/0000-0003-2473-0481
Yule Caroline Nunes da Costa[1] https://orcid.org/0000-0003-0975-9411
Katiusse Rezende Alves[2] https://orcid.org/0000-0003-3393-8567
Tiago Ricardo Moreira[2] https://orcid.org/0000-0002-6606-4942)
Nádia Fontoura Sanhudo[1] https://orcid.org/0000-0001-9714-2854
Geovana Brandão Santana Almeida[1] https://orcid.org/0000-0003-3865-9727
Vilanice Alves de Araújo Püschel[3] https://orcid.org/0000-0001-6375-3876
Fábio da Costa Carbogim[1] https://orcid.org/0000-0003-2065-5998

How to cite:
Franck DB, Costa YC, Alves KR, Moreira TR, Sanhudo NF, Almeida GB, et al. Trauma in elderly people assisted by the mobile emergency care service. Acta Paul Enferm. 2021;34:eAPE03081.

DOI
http://dx.doi.org/10.37689/acta-ape/2021AO03081

Keywords
Geriatric nursing; Aged; Emergency medical services; Wounds and injuries

Descritores
Enfermagem geriátrica; Idoso; Serviços médicos de emergência; Ferimentos e lesões

Descriptores
Enfermería geriátrica; Anciano; Servicios médicos de urgência; Heridas y traumatismos

Submitted
21 November, 2019

Accepted
1 June, 2020

Corresponding author
Fábio da Costa Carbogim
E-mail: fabio.carbogim@ufjf.edu.br

Abstract

Objective: To describe trauma occurrences and mechanisms in elderly people assisted by the Mobile Emergency Care Service (SAMU).

Methods: Cross-sectional study conducted with records of trauma care in elderly subjects in a medium-sized city with an estimated population of 600 thousand inhabitants. The following variables were analyzed: age group, sex, year, trauma mechanism, geographic region of care and death. Data were analyzed by means of absolute and relative frequencies and when appropriate, by means and standard deviation. Statistical differences were assessed using the chi-square test for categorical variables and the ANOVA for continuous variables.

Result: Most people involved were female, with emphasis on falls events. Elderly people aged 60-69 years were more exposed to traffic violence and interpersonal violence, while those aged 70-89 years were more exposed to falls. The most common form of trauma was fall from height (17.5%) and fall from one's own height (62.3%), followed by traffic violence and accidents (12.7%). The central region of the city had the highest number of records of care due to falls, interpersonal violence and traffic violence. Death was the most frequent outcome among men ($p<0.001$) and among people who suffered falls ($p=0.024$).

Conclusion: The results can contribute to understand trauma mechanisms in elderly people and direct health policies within the scope of health promotion, prevention and recovery.

Resumo

Objetivo: Descrever as ocorrências e os mecanismos de trauma em idosos socorridos pelo Serviço de Atendimento Móvel de Urgência.

Métodos: Estudo transversal, realizado com registros de atendimento de trauma em idosos, em cidade de porte médio, com população estimada de 600 mil habitantes. Foram analisadas as variáveis: faixa etária, sexo, ano, mecanismo de trauma, região geográfica do atendimento e óbito. Os dados foram analisados por meio de frequências absolutas e relativas e, quando apropriado, por médias e desvio padrão. As diferenças estatísticas foram avaliadas pelo teste qui-quadrado, para variáveis categóricas, e ANOVA, para contínuas.

Resultado: A maioria dos envolvidos era do sexo feminino, com destaque para eventos de quedas. Os idosos com faixa etária entre 60 e 69 anos foram mais expostos à violência no trânsito e à violência interpessoal; já os idosos entre 70 e 89 anos, a quedas. A forma mais comum de trauma foi queda de altura (17,5%), da própria altura (62,3%), seguida da violência no trânsito e acidentes (12,7%). A região da cidade com maiores registros de atendimento por quedas, violência interpessoal e no trânsito foi a área central. O óbito foi o desfecho mais frequente entre homens ($p<0,001$) e entre pessoas que sofreram quedas ($p=0,024$).

[1]Universidade Federal de Juiz de Fora, Juiz de Fora, MG, Brazil.
[2]Universidade Federal de Viçosa, Viçosa, MG, Brazil.
[3]Escola de Enfermagem da Universidade de São Paulo, São Paulo, SP, Brazil.

Conflicts of interest: none to declare.

Conclusão: Os resultados podem contribuir para a compreensão dos mecanismos de trauma no idoso e o direcionamento de políticas de saúde no âmbito da promoção, da prevenção e da recuperação da saúde.

Resumen

Objetivo: Describir los casos y los mecanismos de lesión en adultos mayores socorridos por el Servicio de Atención Móvil de Urgencia.

Métodos: Estudio transversal, realizado con registros de atención de lesiones por trauma en adultos mayores, en una ciudad de tamaño medio, con una población estimada de 600.000 habitantes. Las variables analizadas fueron: grupo de edad, sexo, año, mecanismo de lesión, región geográfica de la atención y fallecimiento. Los datos fueron analizados mediante frecuencias absolutas y relativas y, cuando fue conveniente, por promedios y desviación típica. Las diferencias estadísticas fueron analizadas con la prueba χ^2 de Pearson en variables categóricas y con ANOVA en variables continuas.

Resultado: La mayoría de las personas involucradas era de sexo femenino, con énfasis en eventos de caídas. Los adultos mayores del grupo de edad entre 60 y 69 años estuvieron más expuestos a la violencia en el tránsito y a la violencia interpersonal y los del grupo entre 70 y 89 años a caídas. La forma más común de lesión fue caída de altura (17,5 %), de la propia altura (62,3 %), seguida por la violencia en el tránsito y accidentes (12,7 %). La región de la ciudad con mayores registros de atención por caídas, violencia interpersonal y en el tránsito fue el área central. El fallecimiento fue el desenlace más frecuente entre los hombres ($p<0,001$) y entre las personas que sufrieron caídas ($p=0,024$).

Conclusión: Los resultados pueden contribuir para comprender los mecanismos de lesión en el adulto mayor y orientar políticas sanitarias en el ámbito de la promoción, prevención y recuperación de la salud.

Introduction

The Brazilian elderly population reached the mark of 30 million in 2019, which has led experts to estimate that in 2030, the country will be the fifth largest elderly population in the world.[1,2] In parallel, with the advance of health policies and encouragement of healthy living habits and practices, this population has been living actively and delaying the onset of natural organic deficits of aging.[2] Thus, more important than establishing the beginning of the age group that defines an elderly person, is the mapping and definition of common vulnerabilities to this population.[2,3]

Studies indicate that intrinsic factors to aging, such as motor, sensory and cognitive deficits are weaknesses of subtle onset over time and they expose the elderly to a higher risk of trauma and complications.[3,4] These factors, added to extrinsic factors such as poor lighting, slippery and uneven floors, presence of obstacles, public roads conditions, among others, contribute greatly to the triggering of trauma.[3-6]

Trauma is characterized by a set of harmful disorders caused by a physical agent with varying extension and etiologies.[7,8] It is the third leading cause of death in the country, behind only cardiovascular diseases and malignant neoplasms.[4] Studies highlight that falls are the most common cause of trauma in the elderly population, followed by traffic accidents and violence.[4,8] Falls represent up to two thirds of accidents in this population, thereby they are one of the main predictors of morbidity and mortality in the country.[3,8] In 2013, there were 93,312 hospitalizations for falls in people over 60 years, representing approximately 256 elderly patients hospitalized for falls per day.[4,9]

Trauma in elderly people often results in injuries and fractures that compromise the Activities of Daily Living, increase institutionalization rates and can progress to decline in general health status.[7] In turn, this increases the costs of hospitalization and other health services, and shows that trauma is an important problem for public health and nursing care.[3,8-10]

A time series study analyzed the magnitude and trend of hospitalization rates for traumatic injuries in intensive care units for 18 years. The results showed trauma was the fourth cause of hospitalizations in intensive care units. Rates were twice as high in men and had a higher average annual growth for people aged 60 and over.[11]

For the multidisciplinary team, which includes nursing, epidemiological studies on trauma in the elderly can contribute to information for planning, care strategies and continuing education. Since the nursing team is often the first to assist elderly (poly) trauma patients, evidence-based qualification policies can contribute to reduce complications and temporary or permanent sequelae.[5,6,8]

On the other hand, despite the growing occurrence of trauma in the elderly population, the literature still lacks investigations identifying risk factors, trauma mechanisms, age group, sex, among other

variables that contribute to prevent and guide public policies.[8,10,11]

The aforementioned information and the importance of investigations assessing the impact of the elderly population's vulnerability according to what is established by the National Agenda for Health Research Priorities[12] justify the performance of this study. The aim was to describe trauma occurrences and mechanisms in elderly people assisted by the Mobile Emergency Service (Portuguese acronym: SAMU).

Methods

This is a cross-sectional study developed from records of the SAMU in a medium-sized city in the interior of Minas Gerais with an estimated population of 600 thousand inhabitants. All trauma records in people aged over 60 years from the period between 2014 and 2018 were included. Of 6,233 records, 193 (3%) were excluded because they were incomplete or duplicated.

The year 2014 was established as a milestone for the beginning of data collection, because SAMU was linked to the Intermunicipal Health Consortium of the Southeast Region and all records were computerized, which guaranteed the standardization of information with data collected in real time.

After the request for the SAMU by the population, starts the completion of information with insertion of data such as name, age group, sex, place of occurrence and reason for request. During assistance, the team informs the victim's clinical condition via electronic device with internet access or emergency service phone (number 192) to the regulator, who provides guidance on the performance of procedures and the hospital unit to which the victim should be sent. Subsequently, after completion of the service by SAMU, all information is stored in a database.

The data collection script and the organization of information were performed by the researchers following the information contained in the SAMU database. Trauma was defined as a dependent variable and independent variables were age, sex, year, trauma mechanism (type of trauma), geographic region of care and death.

The descriptive analysis of variables of sex, age group, geographic region, trauma mechanism and occurrence of death regarding years 2014 to 2018 was performed. Next, sex, age group and geographic region were evaluated in relation to the main trauma mechanisms. Later, the occurrence of death was described in relation to sex, age group, geographic region, trauma mechanism and year.

In data analysis, the main trauma mechanisms were grouped into four categories: falls (falling from one's own height, from height, from a bicycle, horse and motorcycle), interpersonal violence (physical aggression, self-harm, injury with bladed weapon and firearm injury), traffic violence (car/motorcycle/bicycle accidents and collisions) and generic trauma (work accident and agricultural machinery accident, drowning, aggression by animals, any superficial injury, burns, electrical trauma and isolated musculoskeletal trauma). The less frequent injury mechanisms were classified as 'generic trauma'. The occurrence of death was categorized as present or absent.

The age variable was categorized into age groups, as follows: 60-69 years; 70-79 years; 80-89 years; greater than or equal to 90 years. The variable of region of the municipality where the trauma occurred was organized into central, north, northeast, south, southeast, east, west and rural.

Categorical variables were presented by means of absolute and relative frequencies, and continuous variables by mean and standard deviation. For categorical variables, when appropriate, statistical differences were assessed using the chi-square or Fisher's exact test. For continuous variables, Analysis of Variance (ANOVA) was applied when appropriate.

The analyzes were performed using the Statistical Software Stata/SE Version 13.1 (StataCorp, College Station, Texas) at a 95% confidence level ($p<0.05$).

The study was approved by the Research Ethics Committee under Certificate of Presentation for Ethical Appreciation under number CAAE 83369818.3.0000.5147 and opinion number 2.586.021.

Table 1. Characterization of prehospital care for elderly people victim of trauma between 2014 and 2018 (n=6,040)

Variables		2014 n(%)	2015 n(%)	2016 n(%)	2017 n(%)	2018 n(%)	Total n(%)	p-value‡
Sex*	Female	475(59.5)	630(56.7)	688(53.1)	720(56.4)	860(55.1)	3373(55.8)	0.059
	Male	323(40.5)	481(43.3)	607(46.9)	556(43.6)	700(44.9)	2667(44.2)	
		76.3(9.6)	75.6(9.4)	75.6(9.6)	75.8(9.7)	74.6(10.3)	75.5(9.8)	0.007§
Age group†*	60-69	226(28.3)	330(29.7)	418(32.3)	410(32.1)	576(36.9)	1960(32.4)	0.006
	70-79	255(32.0)	360(32.4)	394(30.4)	384(30.1)	441(28.3)	1834(30.4)	
	80-89	236(29.6)	327(29.4)	361(27.9)	365(28.6)	400(25.6)	1689(28.0)	
	≥ 90 years	81(10.1)	94(8.5)	122(9.4)	117(9.2)	143(9.2)	557(9.2)	
Geographic region*	Central	256(32.0)	375(33.7)	419(32.4)	427(33.5)	479(30.7)	1956(32.4)	< 0.001
	East	109(13.7)	211(19.0)	237(18.3)	174(13.6)	242(15.5)	973(16.1)	
	North	220(27.6)	291(26.2)	343(26.5)	355(27.8)	542(34.7)	1751(29.0)	
	West	48(6.0)	64(5.8)	62(4.8)	78(6.2)	75(4.8)	327(5.4)	
	South	121(15.2)	155(13.9)	197(15.2)	211(16.5)	202(13.0)	886(14.7)	
	Rural	44(5.5)	1(1.4)	37(2.8)	31(2.4)	20(1.3)	147(2.4)	
Type of trauma*	GA	29(3.6)	58(5.2)	71(5.5)	80(6.3)	59(6.3)	297(4.9)	< 0.006
	Falls	652(81.7)	911(82.0)	1039(80.2)	1019(79.9)	1259(80.8)	4880(80.8)	
	IV	28(3.5)	15(1.4)	28(2.2)	21(1.6)	34(2.2)	126(2.1)	
	TV	89(11.2)	127(11.4)	157(12.1)	156(12.2)	208(13.3)	737(12.2)	
Death*	No	775(97.1)	1087(97.8)	1275(98.5)	1264(99.0)	1526(97.8)	5927 (98.1)	0.016
	Yes	23(2.9)	24(2.2)	20(1.6)	12(1.0)	34(2.2)	113(1.9)	

Source: Mobile Emergency Service of Juiz de Fora, Minas Gerais.
‡ Chi-square test; *Absolute and relative frequency; †Mean and standard deviation; §Anova; GA – generic accident; IV –interpersonal violence; TV – traffic violence

Results

The study included 6,040 records. Most assistances were provided to elderly women (55.8%), mean age of 75.5 years (standard deviation: 9.8), who had suffered falls (80.8%) in the central region of the city (32.4%). Of the total records, 113 (1.9%) elderly people died (Table 1).

The most common trauma mechanisms were falls from height (17.5%) and falls from one's own height (62.3%), followed by traffic violence, especially collision (6.1%) and accidents involving cars, motorcycle and bicycle (6.6%). For generic trauma mechanisms, 297 (4.9%) records were defined as other forms of trauma, in addition to falls, traffic violence and interpersonal violence (Table 2).

When associating sociodemographic variables with trauma mechanisms in relation to the proportion between sex, women were the most affected by falls (58.9%) and generic accidents (52.9%), while men were the most exposed to interpersonal (72.2%) and traffic violence (58.7%). When comparing the proportion between age groups, elderly subjects aged 60-69 years were more frequently involved in traffic (50.8%) and interpersonal violence (6.9%), while those aged 70-89 years were the most exposed to falls. The city region with more records of assistance due to falls, interpersonal violence and traffic violence was the central area (Table 3).

Death was the most frequent outcome among men (p<0.001) and among people who suffered falls (p=0.024). There was no difference in the oc-

Table 2. Trauma mechanisms in elderly people and outcomes recorded by the Mobile Emergency Service between 2014 and 2018 (n=6,040)

Trauma mechanisms	Death occurrence		
	No (n=5,927) n(%)	Yes (n=113) n(%)	Total (n=6,040) n(%)
Work/agricultural machinery accident*	15(0.2)	0(0.0)	15(0.2)
Accident involving car/motorcycle/bicycle	391(6.6)	10(8.8)	401(6.6)
Drowning*	4(0.1)	1(0.8)	5(0.1)
Animal aggression*	19(0.3)	0(0.0)	19(0.3)
Physical aggression	94(1.6)	2(1.8)	96(1.6)
Collision	356(6.0)	14(12.4)	370(6.1)
Melee weapon injury	19(0.3)	0(0.0)	19(0.3)
Firearm wound	9(0.1)	2(1.8)	11(0.2)
Any superficial wound*	88(1.5)	0(0.0)	88(1.5)
Fall from one's own height	3704(62.5)	56(49.6)	3760(62.3)
Fall from height	1029(17.4)	26(23.0)	1055(17.5)
Bicycle fall	28(0.5)	0(0.0)	28(0.5)
Horse fall	3(0.1)	0(0.0)	3(0.1)
Burn*	15(0.2)	0(0.0)	15(0.2)
Electric trauma*	2(0.1)	0(0.0)	2(0.1)
Isolated musculoskeletal trauma*	151(2.5)	2(1.8)	153(2.5)

Source: Mobile Emergency Service of Juiz de Fora, Minas Gerais.
* Generic trauma: less frequent accidents

Table 3. Characterization of prehospital care of elderly trauma victims by trauma mechanism, 2014-2018 (n = 6,040)

Variable	Type of trauma				Total n(%)	p-value*
	Generic accidents n(%)	Falls n(%)	Interpersonal violence n(%)	Traffic violence n(%)		
Sex*						
Female	157(52.9)	2877(58.9)	35(27.8)	304(41.3)	3373(55.8)	< 0.001
Male	140(47.1)	2003(41.0)	91(72.2)	433(58.7)	2667(44.2)	
Age group* (years)						
60-69	127(42.8)	1381(28.3)	78(61.9)	374(50.8)	1960(32.4)	< 0.001
70-79	81(27.3)	1496(30.7)	33(26.2)	224(30.4)	1834(30.4)	
80-89	66(22.2)	1494(30.6)	13(10.3)	116(15.7)	1689(28.0)	
≥90	23(7.7)	509(10.4)	2(1.6)	23(3.1)	557(9.2)	
Geographic region*						
Central	104(35.0)	1543(31.6)	44(34.9)	265(36.0)	1956(32.4)	0.002
East	33(11.1)	817(16.8)	25(19.8)	98(13.3)	973(16.1)	
North	92(31.0)	1407(28.8)	31(24.6)	221(30.0)	1751(29.0)	
West	13(4.4)	278(5.7)	5(4.0)	31(4.2)	327(5.4)	
South	47(15.8)	727(14.9)	16(12.7)	96(13.0)	886(14.7)	
Rural	8 (2.7)	108(2.2)	5(4.0)	26(3.5)	147(2.4)	
Death*						
No	294 (99.0)	4797(98.3)	122(96.8)	714(96.9)	5927(98.1)	0.024
Yes	3 (1.0)	83(1.7)	4(3.2)	23(3.1)	113(1.9)	

Source: Mobile Emergency Service of Juiz de Fora, Minas Gerais.
*Chi-square test.

Table 4. Association between independent variables and the occurrence of death (n=6,040)

Characteristics	Death			p-value*
	No	Yes	Total	
Sex				
Female	3330(56.2)	43(38.1)	3373(55.8)	
Male	2597(43.8)	70(61.9)	2667(44.2)	< 0.001
Age group (years)				
60-69	1915(32.3)	45(39.8)	1960(32.4)	0.135
70-79	1798(30.3)	36(31.9)	1834(30.4)	
80-89	1662(28.0)	27(23.9)	1689(28.0)	
≥ 90	552(9.3)	5(4.4)	557(9.2)	
Geographic region*				
Central	1919(32.4)	37(32.7)	1956(32.4)	0.264
East	953(16.1)	20(17.7)	973(16.1)	
North	1722(29.0)	29(25.7)	1751(29.0)	
West	316(5.3)	11(9.7)	327(5.4)	
South	874(14.8)	12(10.6)	886(14.7)	
Rural	143(2.4)	4(3.6)	147(2.4)	
Tipo de trauma*				
Generic accident	294(5.0)	3(2.7)	297(4.9)	0.024
Falls	4797(80.9)	83(73.5)	4880(80.8)	
Interpersonal violence	122(2.1)	4(3.5)	126(2.1)	
Traffic violence	714(12.0)	23(20.3)	737(12.2)	
Year*				
2014	775(13.1)	23(20.4)	798(13.2)	0.014
2015	1087(18.3)	24(21.3)	1111(18.4)	
2016	1275(21.5)	20(17.7)	1295(21.4)	
2017	1264(21.3)	12(10.6)	1276(21.2)	
2018	1526(25.8)	34(30.0)	1560(25.8)	

Source: Mobile Emergency Service of Juiz de Fora, Minas Gerais.
* Chi-square test.

currence of death between age groups and between regions of the city (Table 4).

Discussion

The limitation of this study refers to the non-availability of other sociodemographic variables in the electronic database. Furthermore, data are from a medium-sized city and may not represent other realities. On the other hand, the findings can contribute to understand the trauma occurrence and mechanisms and the trauma prevention policies for the elderly population, as well as the direction of nursing and health discussions and actions within the scope of health promotion and recovery.

The results of the investigation are compatible with the national and international literature on trauma and its mechanisms of involvement in elderly people.[8,13-15] The high rates of trauma and its relationship with the morbidity and mortality of this population show the need for sound public policies, social and urban planning, and specific health promotion and education actions.[2,4]

Nursing professionals inserted in different care contexts have a fundamental role in policies and ac-

tions of planning, promotion and health education for the elderly in order to mitigate the impact of intrinsic and extrinsic factors on the health of this population.[16,17] In addition, as these professionals often provide first aid to victims, they are protagonists in the prevention of complications and reduction of sequelae.[17]

In the present study, a predominance of the female sex was found among elderly victims of trauma, especially falls. These data corroborate findings in the literature that highlight the following factors as possible causes: decreased muscle strength; osteoporosis; restriction to domestic life; deficits in sensory functions that affect balance and gait when performing tasks; and greater female longevity.[18-20]

Studies relate fractures caused by falls in women to the possible increase in musculoskeletal fragility initiated in the postmenopausal period, because of the estrogen reduction, as well as their greater exposure to domestic activities.[21,22] A longitudinal study conducted in England showed other risk factors for falls among women, such as depression, urinary incontinence, marital status and low schooling.[23]

Trauma mechanisms are among the main causes of death in the elderly, and falls represent up to two thirds of accidents involving the elderly hence, one of the main predictors of morbidity and mortality.[24,25]

As the population ages, trauma becomes an emerging problem progressing over the years. In a study conducted in a medium-sized city in the Northeast of Brazil, was found a high number of trauma care in more advanced age groups, and elderly subjects over 80 years of age were female.[6]

Most elderly individuals of the present study were aged 60-79 years, mean of 75 years. In national and international studies, mean ages vary, although trauma tends to be more frequent among young elderly people, while morbidity and mortality is directly related to advanced age and sex.[4,7,8,10]

Studies link high age to greater chances of hospitalization and mortality, given the declining functional capacity.[14,26,27] With regard to sex, morbidity and mortality are high among men because of their tendency to get involved in intense and risky activities.[8,23,28] In the present study, trauma, especially falls, was widely registered in all age groups. In line with the literature, most men in the present study presented trauma related to interpersonal violence and traffic accidents. In addition, when evaluating the outcome of the care service, men and victims of falls were the most vulnerable to death.

Between 2014 and 2018, there was a progressive and significant increase in trauma records involving elderly people, with emphasis on the central region of the city. This finding may be related to the high population concentration, thereby exposing a greater contingent of elderly people to falls, interpersonal violence and traffic accidents, among others.[4,8]

A study[4] identified that Brazilian capitals concentrated high rates of deaths and hospitalizations caused by trauma in the elderly, with a 200% increase in mortality rates between years 1996 and 2012.

Thus, the aging of the population demands a wide discussion on actions of disease prevention, health promotion and recovery, in addition to safety management policies and programs aimed at elderly subjects.[4,13,22]

Conclusion

When analyzing trauma records and mechanisms in elderly people assisted by a Mobile Emergency Care Service, most people involved were female and there was a higher frequency of records due to falls from height or falls from one's own height. The proportionally more frequent trauma mechanisms in males were interpersonal and traffic violence. Elderly people aged 60-69 years were more exposed to traffic violence and interpersonal violence, while those aged 70-89 years were more exposed to falls. The city region with more records of trauma care due to falls, interpersonal and traffic violence was the central area. Death was the most frequent outcome among men and among people who suffered falls.

Acknowledgments

We would like to thank the Federal University of Juiz de Fora, Brazil, for the financial support for this research.

Collaborations

Franck DBP, Alves KR and Carbogim FC were responsible for the design of the project, writing of the article, analysis and interpretation of data, relevant critical review of the intellectual content and contributed to the final approval of the version to be published. They were responsible for the entire study and ensured its accuracy and integrity. Costa YCN, Moreira TR, Sanhudo NF, Almeida GBS and Püschel VAA were responsible for the relevant critical review of the intellectual content and contributed to the final approval of the version to be published.

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