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ORIGINAL ARTICLE

Analysis of knowledge about acute myocardial infarction in individuals treated at the outpatient clinic of a medical school in Belo Horizonte

Análise do conhecimento sobre infarto agudo do miocárdio em indivíduos atendidos no ambulatório de uma faculdade de medicina de Belo Horizonte

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ABSTRACT

Introduction: Acute myocardial infarction (AMI) is one of the leading causes of death in Brazil. Recognizing its signs and symptoms is essential for prompt and effective care. In this context, evaluating the population's knowledge about AMI is crucial to identify and address information gaps. **Objective:** To assess the level of knowledge about AMI among people attending an outpatient clinic at a medical school in Belo Horizonte. **Methods:** This was a cross-sectional, observational study involving 150 volunteers in the waiting area of an outpatient clinic. Knowledge about AMI was evaluated through a questionnaire on signs and symptoms. The significance level was set at 5% for all tests. **Results:** The study included 150 participants, with 103 (68.7%) women and 47 (31.3%) men. Only five individuals (3.3%) correctly identified all possible locations of anginal pain. Regarding pain radiating sites, no participant identified all options, and 18 (12%) correctly identified half or more of the options. Concerning associated symptoms, 36 (24%) achieved 100% accuracy, while 30 (20%) had no correct answers. Additionally, 67 (44.7%) said they did not know what measures could prevent AMI, and 68 (48%) scored no correct answers. **Conclusions:** A gap in knowledge about AMI was observed among the participants. The low rate of correct identification of signs and symptoms emphasizes the need for educational programs to improve understanding of this condition.

Keywords: Myocardial infarction; Health education; Disease prevention; Information dissemination.

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RESUMO

Introdução: O infarto agudo do miocárdio (IAM) é uma das principais causas de morte no Brasil. O reconhecimento de seus sinais e sintomas é essencial para um atendimento rápido e eficaz. Nesse contexto, avaliar o conhecimento da população sobre IAM é crucial para identificar e suprir lacunas de informação. **Objetivo:** Avaliar o nível de conhecimento sobre IAM entre pessoas atendidas em um ambulatório de uma faculdade de medicina em Belo Horizonte. **Métodos:** Trata-se de um estudo observacional transversal envolvendo 150 voluntários na sala de espera de um ambulatório. O conhecimento sobre IAM foi avaliado por meio de um questionário sobre sinais e sintomas. O nível de significância adotado foi de 5% para todos os testes. **Resultados:** O estudo incluiu 150 participantes, sendo 103 (68,7%) homens e 47 (31,3%) mulheres. Apenas cinco indivíduos (3,3%) identificaram corretamente todas as possíveis localizações da dor anginosa. Em relação aos locais de irradiação da dor, nenhum participante identificou todas as opções, e 18 (12%) identificaram corretamente metade ou mais das opções. Em relação aos sintomas associados, 36 (24%) obtiveram 100% de acerto, enquanto 30 (20%) não obtiveram respostas corretas. Além disso, 67 (44,7%) afirmaram não saber quais medidas poderiam prevenir o IAM e 68 (48%) não obtiveram respostas corretas. **Conclusões:** Observou-se uma lacuna no conhecimento sobre IAM entre os participantes. A baixa taxa de identificação correta de sinais e sintomas enfatiza a necessidade de programas educacionais para melhorar a compreensão dessa condição.

Palavras-chave: Infarto do miocárdio; Educação em saúde; Prevenção de doenças; Disseminação de informações.

Introduction

Acute myocardial infarction (AMI) is a leading cause of morbidity and mortality worldwide, including in Brazil[1,2]. Most deaths from AMI occur within the first hours of onset. It is estimated that 40% to 65% of fatal cases occur within the first hour and 80% within the first 24 hours[3].

Early diagnosis and reperfusion therapy are crucial in myocardial infarction. Treatment effectiveness and increased survival are highly correlated with shorter recovery times from presentation to the health service. However, in Brazil, patients seek emergency services, on average, between 3 and 4 hours after the onset of signs and symptoms[4-6].

According to the *American Heart Association,* the AMI chain of survival is a fundamental strategy for the emergency treatment of patients with cardiovascular disease (CVD), consisting of four main steps: early recognition and activation of the emergency medical response system; early cardiopulmonary resuscitation; early defibrillation and advanced life support; and post-cardiac arrest care. However, the effectiveness of the chain of survival depends on the knowledge and adequate training of the entire chain of care, from the general population to healthcare professionals involved in patient management[5]. Awareness of the symptoms of AMI is crucial to ensuring early medical attention, highlighting the importance of recognizing symptoms beyond chest pain. Classic symptoms of angina include pain or discomfort in areas such as the chest, epigastrium, jaw, shoulders, back, or upper limbs. It is typically triggered or aggravated by physical activity or emotional stress and is relieved by rest and/or the use of nitroglycerin and its derivatives. Other atypical symptoms may include malaise, weakness, back pain, abdominal pain, sweating, paleness, temporary loss of consciousness, feeling of impending doom, nausea, and vomiting[7-9].

Considering that the initial chain of care for CVDs depends on early identification, it is essential to assess the population's knowledge about AMI to identify and fill information gaps. This study aims to assess knowledge of the signs and symptoms of AMI in adults attending the outpatient clinic of a private university in Belo Horizonte, which offers services to the public healthcare system. The goal is to provide data that will support the creation of outreach projects aimed at educating the community at large so they can recognize the signs of AMI, with a particular focus on the main questions raised during the questionnaires.

Methods

Study design

This is a cross-sectional, observational study, submitted to the Research Ethics Committee of the Faculty of Medical Sciences of Minas Gerais (CEPCM-MG), CAAE: 72830823.8.0000.5134, approved on August 21, 2023. Data collection was conducted in the waiting room of the outpatient clinic of a private educational institution that provides services through the Unified Health System (SUS), located in Belo Horizonte, Minas Gerais, Brazil, from November 2023 to January 2024.

Data collection was conducted through a questionnaire developed by researchers, which included dichotomous, open-ended, and multiple-choice questions about the participants' socioeconomic data and medical history, as well as various signs and symptoms of AMI. To ensure clarity and relevance of the content, the questionnaire was developed following methodological steps that included a review of specialized literature on acute coronary syndrome and the analysis of similar instruments already used in previous studies with the same objective as our research. However, considering that the target population of our study experiences different realities from those previously assessed, we sought to adapt the content and approach of the questions to reflect this specific context better. Face and content validity were assessed by expert advisors, who analyzed the relevance, clarity, and appropriateness of the proposed questions. The suggestions received were incorporated into the final version of the questionnaire, ensuring that the items were understandable and appropriate to the study objectives and the particularities of the population studied.

Before data collection began, participants were informed about the Informed Consent Form and were asked to sign it, in accordance with resolution 466/2012.

Participants

To determine the sample size, a sample size calculation was performed based on similar studies, adopting a statistical power of 0.80, a significance level of 5%, and a 95% confidence level. A moderate effect size (w=0.3) was considered, according to Cohen's classification for the chi-square test. The expected proportions were estimated from the literature, and the calculation indicated that the ideal sample would be 150 participants to ensure the statistical robustness of the proposed analyses.

The study included individuals aged 18 years or older, users of the outpatient clinic of a private educational institution in Belo Horizonte, Minas Gerais. Individuals with intellectual disabilities that would compromise their ability to respond to the questionnaire and those with a previous diagnosis of acute myocardial infarction were excluded, as they might have prior knowledge of the condition. Healthcare professionals were also excluded for similar reasons.

During the study, 162 individuals were approached in the outpatient waiting room. Of these, 7 declined to participate due to unavailability or lack of time, 2 were excluded due to a previous acute myocardial infarction, and 3 were excluded because they were healthcare professionals.

Instruments

Data collection was conducted using a structured questionnaire developed specifically for this research by the authors, containing a combination of dichotomous, open-ended, and multiple-choice questions. The questionnaire consisted of questions related to the participants' socioeconomic data, previous medical history, as well as questions about signs and symptoms associated with acute myocardial infarction (AMI). Participants were asked to judge whether they considered each sign or symptom to be associated with AMI.

The data collection instrument was administered in person by the researchers, ensuring uniformity in questionnaire administration and minimizing data collection bias. Data collection was conducted in a standardized manner, ensuring uniformity in approaches and minimizing potential interviewer bias. To this end, all data collectors participated in prior training, which covered the study objectives, questionnaire content, operational definitions of terms, and the correct way to approach participants. During the training, simulated interviews using the questionnaire were conducted to standardize the application and clarify any doubts regarding question interpretation. Furthermore, adherence to the protocol was periodically monitored by study supervisors during data collection to ensure consistency of approaches and the quality of the data obtained.

The primary purpose of data collection was to obtain accurate and detailed information on the study population's level of knowledge regarding AMI, intending to identify potential gaps in awareness and recognition of the disease's signs and symptoms. This information is essential for developing more effective prevention and treatment strategies that can be targeted to address identified gaps in the population's awareness of AMI.

Procedures

Before data collection began, the study was duly submitted to the Research Ethics Committee of the Faculty of Medical Sciences of Minas Gerais (CEPCM-MG) and approved in accordance with current ethical criteria. Participants' signatures on the Informed Consent Form were also obtained, ensuring that all participants were fully informed about the objectives, procedures, and potential risks and benefits of the study.

With ethics approval and consent formalized, the research students began recruiting participants at the outpatient clinic. Recruitment took place in person and followed previously established inclusion criteria. Data collection was conducted in a standardized manner, ensuring uniformity in approaches and minimizing potential bias.

Statistical analysis

After data collection through the questionnaire, all information was stored in a spreadsheet with restricted access to the researchers and advisors responsible for the project. The spreadsheet, created before the analysis, served to condense the results obtained, facilitating the identification of potential knowledge gaps regarding AMI in the population.

Qualitative variables are presented as absolute and relative frequencies, and quantitative variables are presented as mean ± standard deviation or median ± interquartile range. Quantitative variables were subjected to the *Shapiro-Wilk or Kolmogorov-Smirnov normality test* and subsequently evaluated by *Student's t-test, Mann-Whitney U-test, Wilcoxon rank-sum test, or ANOVA*. The chi-square and Fisher's exact tests were used to determine associations between qualitative variables. Multivariate logistic regression models were used for bivariate analyses between exposure and outcome variables. Correlations between clinical parameters and sociodemographic parameters were assessed by *Pearson's or Spearman's correlation tests*. Data analysis was performed using the R statistical program, version 4.4.0, with a p-value <0.05 considered significant.

Results

The sample consisted of 150 individuals (Table 1), of which 103 (68.7%) were female and 47 (31.3%) were male, with a varied age distribution. The majority had completed high school (42.6%) and had a monthly income of up to 1 minimum wage (36.7%). Regarding the presence of cardiovascular risk factors, arterial hypertension was the most prevalent (41.3%), followed by a sedentary lifestyle (36.0%). Only 27.3% of the interviewees did not have comorbidities.

Table 2 shows that 68.0% of participants recognized pain as a relevant symptom regarding knowledge of the signs and symptoms of AMI. However, only five individuals (3.3%) correctly identified all possible locations of anginal pain, while 30 (20.0%) correctly identified half of the options. Regarding the locations where pain is felt beyond the point of origin, no participant identified all possibilities, and 18 (12.0%) correctly identified half or more of the options. Regarding associated symptoms, 36 (24.0%) obtained 100% accuracy, while 30 (20%) had no accuracy. Furthermore, 103 people (68.7%) had never received medical advice about the signs and symptoms of AMI; only four (2.7%) interviewees reported having received prior medical advice about ACS prevention, and 42 (28.0%) reported knowing what to do if they suspected an AMI. Finally, 67 (44.7%) stated that they did not know what measures could prevent an AMI, and 68 (48.0%) had no correct answers. Regular physical activity was the most recognized measure in the prevention of AMI, indicated by 50.7% of participants.

Table 3 shows the relationship between the population's prior guidance on identifying and preventing acute coronary syndrome (ACS) and the percentage of correct answers regarding the signs, symptoms, and time to treatment for this condition. A statistically significant association was observed between prior guidance and the percentage of correct answers regarding the areas of the body where pain can be felt (p<0.001), associated symptoms (p <0.001), and time to treatment after the onset of the condition (p=0.036).

Furthermore, the research results indicate an association between the variables age group and number of comorbidities, and the correct answers related to pain irradiation (p<0.001 and p=0.025, respectively), as well as between gender and the type of pain (p=0.007). The other combinations evaluated did not show a statistically significant association.

These results suggest that patients who received prior information about AMI demonstrate a better understanding and recognition of pain location, associated symptoms, and a better estimate of the time required for treatment in cases of ACS. The findings highlight the importance of prior medical information for the early recognition and effective management of ACS, potentially contributing to better clinical outcomes and reduced complications.

Table 1. Sample characterization (n=150).

Variable	N	%
Sex		
Feminine	103	68.70%
Masculine	47	31.30%
Age		
Between 18 and 29 years old	23	15.30%
Between 30 and 40 years old	39	26.00%
Between 41 and 50 years old	49	32.70%
Between 51 and 60 years old	28	18.70%
Between 61 and 70 years old	9	6.00%
Over 71 years old	2	1.30%
Education		
Incomplete elementary education	21	14.00%
Complete elementary education	19	12.70%
Incomplete high school education	13	8.70%
High school completed	64	42.60%
Incomplete higher education	18	12.00%
Completed higher education	9	6.00%
Incomplete postgraduate studies	3	2.00%
Complete postgraduate studies	3	2.00%
Monthly income		
I prefer not to answer	11	7.30%
Unemployed	1	0.70%
Up to 1 minimum wage	55	36.70%
Between 1 and 2 salaries	50	33.30%
Between 2 and 3 salaries	21	14.00%
Above 3 salaries	12	8%

Data presented as absolute and relative frequencies.

Table 4 highlights the need for education and awareness strategies regarding cardiovascular events, given that most of the characteristics analyzed showed an average accuracy rate below 50%, except for symptoms associated with chest pain, which showed an average accuracy rate of 53.17% (95% CI: 47.27–59.06). The assessment of paresis in the context of infarction was the data with the lowest accuracy rate, presenting an average of 10.77% (95% CI: 8.62–12.92).

Table 2. Knowledge about acute myocardial infarction (AMI).

Variable	N	%
Is pain a relevant symptom?		
Yes	102	68.00%
No	12	8%
I don't know	36	24%
Where is the pain located?		
On the chest	117	78%
Epigastric region	25	16.70%
Right hypochondrium	5	3.30%
Left hypochondrium	23	15.30%
I don't know	25	16.70%
Do you know the nature of pain?		
Yes	116	77.30%
I don't know	34	22.70%
What is the nature of pain?		
Tightness	74	49.30%
Point	74	49.30%
Burning	30	20.30%
Does the pain radiate to other parts of the body?		
Yes	87	58%
No	11	7.30%
I don't know	52	34.70%
To which region of the body does the pain radiate?		
Left upper limb	46	30.70%
Right upper limb	11	7.30%
Lower limbs	4	2.70%
Face	15	10%
Cervical	27	18%
Chest	36	24%
Does any part of your body fall asleep?		
Yes	90	60%
No	8	5.30%
I don't know	52	34.70%
Which region of the body does the pain anesthetize?		
Left upper limb	47	31.30%
Right upper limb	6	4.00%
Lower limbs	7	4.70%
Face	28	18.70%
Cervical	11	7.30%
Chest	4	2.70%

continue...

... continuation Table 2

Variable	N	%
Is there associated sweat?		
Yes	74	49.30%
No	8	5.30%
I don't know	68	45.40%
Is there associated dyspnea?		
Yes	93	62%
No	14	9.30%
I don't know	43	28.70%
Is there associated weakness or fatigue?		
Yes	94	62.70%
No	8	5.30%
I don't know	48	32%
Is there associated nausea, indigestion, or abdominal pain?		
Yes	58	38.70%
No	27	18%
I don't know	65	43.30%
Percentage of correct responses associated with symptoms		
0% accuracy	30	20%
25% accuracy	25	17%
50% correct	27	18%
75% correct	32	21%
100% correct	36	24%
Have you received medical advice about the signs and symptoms of ACS?		
Yes	47	31.30%
No	103	68.70%
Do you know what to do if you suspect ACS?		
Yes, I know how to act	42	28%
No, I don't know how to act.	108	72%
Have you received information on how to prevent an SCA?		
No, I never received any information.	83	55.30%
Yes, I have already received information.	67	44.70%
Have you ever received any non-medical advice about prevention?		
Yes	63	42%
No	87	58%
If so, by what means?		
Televisions	31	20.70%
Internet	27	18%
Books and magazines	5	3.30%
Lectures	20	13.30%
Have you ever received medical information about prevention?		
Yes	4	2.70%
No	146	97.30%

continue...

... continuation Table 2

Variable	N	%
Do you think the timing of starting treatment for ACS is important?		
Yes	143	95.40%
No	2	1.30%
I don't know	5	3.30%
Do you know how long after the onset of ACS symptoms you should seek medical help?		
I can't say	41	27.30%
Immediately	102	68%
You should wait between 1 and 3 hours	6	4%
You should wait between 4 and 6 hours	1	0.70%
You should wait between 6 and 10 hours	0	0%
Do you know what measures can prevent SCA?		
No, I don't know.	67	44.70%
Yes I know	83	55.30%
What steps do you consider to help prevent SCA?		
Regular practice of physical activity	76	50.70%
Healthy and balanced diet	45	30%
Control of blood pressure, diabetes and dyslipidemia	38	25.30%
Smoking Prohibited	32	21.30%
Consume alcohol in moderation	34	22.70%

Data presented as absolute and relative frequencies.
Abbreviations: ACS - Coronary syndrome.

Table 3. Variables associated with the question “prior information about AMI symptoms”.

Prior information	No	Yes	p-value
Feature	**n=103**	**n=47**	
Location of pain	0.24 ± 0.16 (0.25)	0.36 ± 0.18 (0.25)	**0.001**
Type of pain	0.37 ± 0.39 (0.33)	0.47 ± 0.38 (0.67)	0.271
Irradiation of pain	0.13 ± 0.18 (0.00)	0.19 ± 0.20 (0.17)	0.358
Associated symptoms	0.44 ± 0.35 (0.50)	0.73 ± 0.31 (0.75)	**<0.001**
Prevention measures	0.27 ± 0.31 (0.00)	0.37 ± 0.28 (0.40)	0.113
Service time	64 (62.14%)	38 (80.85%)	**0.036**

Data presented as mean number of correct answers + standard deviation (median) or as absolute and relative frequencies.

Table 4. Average number of correct answers about AMI.

Characteristics analyzed	Average number of correct answers (95% CI) – in percentage
Where is the pain located?	27.50 (95%CI: 24.67 – 30.33)
What is the nature of the pain?	40.31 (95%CI: 34.03 – 46.60)
Which region of the body does the pain radiate?	15.05 (95%CI: 12.02 – 18.08)
Which region of the body falls asleep?	10.77 (95% CI: 8.62 – 12.92)
Do you recognize the associated symptoms?	53.17 (95%CI: 47.27 – 59.06)
What measures do you consider to help prevent an SCA?	30.00 (95%CI: 25.10 – 34.90)

Data presented as mean number of correct answers + standard deviation (median) or as absolute and relative frequencies.

Discussion

This is a diverse sample in terms of age, educational level, and income, surveyed about the recognition of the main signs and symptoms of ACS. Data analysis revealed limited knowledge about specific AMI symptoms, such as anginal pain and possible areas of the body where pain can be felt beyond the point of origin. Only 3.3% correctly identified all pain sites, and no participant correctly identified all pain radiations, suggesting the need to improve awareness of these aspects to ensure prompt medical attention and initiation of appropriate treatment. Furthermore, the results revealed that individuals without prior knowledge about AMI symptoms had a lower accuracy rate in the management of ACS. This highlights the need for ongoing and comprehensive educational campaigns to mitigate this knowledge gap. Regarding prevention, most participants have a limited understanding of preventive measures, although many (50.7%) recognize regular physical activity as effective. The analysis showed no significant differences between the number of comorbidities in relation to knowledge of symptoms and preventive measures, suggesting that broad and inclusive educational strategies are needed for all groups.

Analysis of similar studies revealed that chest pain was the most recognized symptom among the population, followed by dyspnea, with over 65% of respondents identifying these symptoms. Pain in the arm and/or shoulders was also mentioned, although recognition rates vary considerably across studies[10-13]. In this study, although the results were similar, with pain recognized as the main symptom by 68% of respondents, it was observed that only chest pain was frequently identified, being mentioned by 78% of participants. In contrast, most respondents did not recognize atypical manifestations, such as pain in other locations, for example, the epigastric, right hypochondrium, and left hypochondrium regions, with recognition rates of 16.7%, 3.3%, and 15.3%, respectively.

Regarding the set of signs and symptoms, a study conducted in South Korea by Kim et al. (2016)[10] showed that 88.7% of participants recognized at least one of the AMI symptoms, while only 10.9% were able to associate the five symptoms highlighted in the interview with the disease. In contrast to the findings of Fang et al. (2019)[14] in the United States, approximately 50.2% of respondents recognized the five listed AMI symptoms. Compared to the results found in this study, the percentage of correct answers was significantly lower, with 42% of respondents not recognizing radiation and 38% of participants not recognizing dyspnea as symptoms of AMI.

When compared with emerging countries, a study conducted in Malaysia showed that only 5% of the population recognized the five symptoms of a heart attack, while 22% were completely unaware of the disease[12]. Similarly, a study in India revealed that 67% of respondents had little knowledge of the signs and symptoms of AMI. These data reinforce the findings, suggesting that the results are directly related to socioeconomic variables since most of our respondents did not have a higher education degree (90%) and/or earned less than the minimum wage (36.7%).

In a study conducted by Alsaab et al (2023)[11] in Saudi Arabia, smoking cessation was identified as the most relevant measure for preventing AMI. However, our study found that regular physical activity was the most frequently recognized measure (50.7%), followed by a healthy diet (30%). Practices such as quitting smoking and moderate alcohol consumption were less well-known, with recognition rates of 21.3% and 22.7%, respectively. Considering that smoking and alcohol consumption are very important modifiable risk factors, this finding highlights the importance of raising awareness about the impact of quitting these habits on preventing AMI.

Furthermore, given that AMI is one of the leading causes of morbidity and mortality, with approximately 65% of deaths occurring within the first hour, early recognition of ACS and seeking immediate medical care is crucial[3,15-17]. In this regard, a study by Fukuoka et al. (2010)[18] conducted in the United States and Japan found that the average time to seek care was 4.4 hours in the American sample and 8.3 hours in the Japanese sample. In this context, the time to seek healthcare services should be as short as possible to reduce complications and increase survival. In this study population, a significant result was noted, as 32% of respondents did not report seeking medical help immediately. This corroborates a worse patient prognosis and the need for more complex interventions and procedures by healthcare professionals.

Finally, although the literature suggests that sociodemographic variables, such as education level and income, directly influence the population's knowledge about the signs and symptoms of acute myocardial infarction[10,12,14], this study did not observe a statistically significant association between these variables and the knowledge presented by the interviewees. This result may be related to factors such as the sample size, the distribution of the sociodemographic categories evaluated, or even a possible homogeneity among participants in the outpatient clinic analyzed. It is worth considering that, if a study were conducted with a larger and more heterogeneous sample, the results could have shown statistically significant differences; however, this remains only a hypothesis, and it is not possible to infer this relationship based on the data obtained.

Limitations

This study has limitations because it is a cross-sectional study and represents the knowledge profile of a single-center study, with a sample size limited by the sample size. However, the deficiencies in understanding AMI are consistent with studies conducted at other institutions around the world. Therefore, continued investment in education and awareness is essential to fill this knowledge gap in the community, thereby improving clinical outcomes and patients' quality of life.

Conclusion

In conclusion, this study revealed limited knowledge among participants about the signs, symptoms, and preventive measures of AMI. Although they recognized chest pain as a relevant symptom, there was a notable deficiency in identifying the sites of anginal pain, its radiation, and associated symptoms.

The significant association between prior information about AMI symptoms and a greater understanding of these characteristics reinforces the need for ongoing and comprehensive educational campaigns. Therefore, this study encourages outreach projects aimed at the lay population to educate them about the presentation of ACS. Professional guidance stands out as a tool for early recognition and effective management of ACS, potentially contributing to better clinical outcomes and reduced complications.

Author Contributions

We describe contributions to the papers using the taxonomy (CRediT) provided above:

Conceptualization, Investigation, Methodology, Visualization; Writing – Analysis & Editing: LS Ferrarini. *Project Administration, Supervision & Writing – Original Draft*: PLA Rodrigues. *Validation, Software*: DPG Pires. *Resources; Funding Acquisition, Data Curation; Formal Analysis*: AMA Moreira.

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