Original Article

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Population knowledge about Basic Life Support and the Mobile Emergency Care Service in a municipality of northeastern Brazil

Conhecimento populacional sobre Suporte Básico de Vida e o Serviço de Atendimento Móvel de Urgência de um município do nordeste brasileiro

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Abstract
INTRODUCTION: The process of epidemiological transition associated with nutritional transition has significantly increased the prevalence of non-communicable chronic diseases. Among these chronic conditions, acute myocardial infarction (AMI) stands out due to its high mortality rate. The main and most complicated progression of AMI consists of arrhythmias with cardiorespiratory arrest, which often occur in the pre-hospital environment and require immediate support. OBJECTIVE: To assess the population's knowledge about basic life support and characterize the care provided by the Mobile Emergency Care Service (SAMU) regarding the service's profile, structural support, and response time in a municipality of northeastern Brazil. MATERIAL AND METHODS: A quantitative cross-sectional study was conducted with 106 participants in 2021, using questionnaires to evaluate the population's knowledge and collect secondary data from the Mobile Emergency Care Service's regulation center. RESULTS: It was observed that poor training in basic life support is associated with worse outcomes related to recognizing cardiopulmonary arrest (χ^2 = 5.095, p= 0.024) and performing cardiopulmonary resuscitation (χ^2 = 5.251, p = 0.022). It was also identified that the response time of the Mobile Emergency Care Service ranges from 10 to 15 minutes. CONCLUSIONS: The lack of knowledge and training of the population about basic life support are associated with ineffective measures in emergency situations.
Keywords: acute myocardial infarction; cardiac arrest; emergencies. first aid

Resumo
INTRODUÇÃO: O processo de transição epidemiológica associado à transição nutricional aumentou de forma significativa a prevalência de doenças crônicas não transmissíveis. Dentre essas condições crônicas, o infarto agudo do miocárdio destaca-se devido à sua alta taxa de mortalidade. A principal, e mais complicada, evolução do infarto são arritmias com ritmo de parada cardiorrespiratória, que muitas vezes acontecem no ambiente extra-hospitalar e demandam um suporte imediato. OBJETIVO: Avaliar o conhecimento populacional acerca do suporte básico de vida e caracterizar o Serviço de Atendimento Móvel de Urgência quanto ao perfil de atendimento, suporte estrutural e tempo de resposta, em município do nordeste brasileiro. MATERIAIS E MÉTODOS: Estudo de abordagem quantitativa com delineamento transversal desenvolvido com 106 participantes, no ano de 2021, utilizando questionários para avaliar o conhecimento da população, bem como a coleta de dados secundários na central de regulação do Serviço de Atendimento Móvel de Urgência. RESULTADOS: Observou-se que a baixa capacitação em suporte básico de vida está relacionada com piores desfechos relacionados ao reconhecimento de uma parada cardiorrespiratória (χ^2 = 5,095, p = 0,024) e a realização de reanimação cardiopulmonar (χ^2 = 5,251, p = 0,022). Identificou-se, também, que o tempo resposta do Serviço de Atendimento Móvel de Urgência é de 10 a 15min. CONCLUSÃO: A falta de conhecimento e treinamento da população sobre suporte básico de vida estão associados a medidas ineficazes frente a situações de emergência.
Palavras-chave: infarto agudo do miocárdio; parada cardiorrespiratória; emergências. primeiros socorros.

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Introduction

The process of epidemiological transition, which began 60 years ago in Brazil, is characterized by a progressive increase in the prevalence of non-communicable chronic diseases (NCDs) to the detriment of infectious diseases, consequently modifying the national morbimortality profile and increasing the life expectancy of the population[1]. This process is justified by sanitary measures, advances in public health, use of vaccines, and improvements in pharmacological therapies with the introduction of new antibiotics[2].

Nutrition transition is associated with the process of epidemiological tradition, beginning in Brazil approximately 50 years ago and being often associated with two characteristics: larger food supply and increasing bad eating habits (characterized by the excessive consumption of ultra-processed foods with high contents of fat, salt, and sugar, and low nutrients)[3]. These aspects changed the national morbimortality scenario by decreasing the prevalence of malnutrition and exponentially increasing overweight and obesity cases, consequently increasing the frequency of NCDs[4].

According to data from the ELSA-Brazil cohort study, coronary artery disease (CAD) is the most prevalent NCD in the population with ages from 35 to 74 years. According to Santos *et al.*[6], Brazil shows high mortality rates by CAD, amounting to 183.3 per 100,000 inhabitants, which places the country among those with the highest CAD mortality rates in the world[6].

Among CADs, acute myocardial infarction (AMI) is the most severe manifestation, showing high morbimortality rates worldwide[7]. AMI consists of an obliteration of the arterial lumen, whose most frequent etiology is coronary thrombosis, causing ischemia and, consequently, necrosis of the myocardium[8]. This clinical picture has an incidence of 79 per 100,000 inhabitants and a prevalence of 1.63% (1,564 per 100,000 inhabitants), and it is estimated that 3.3 million people lived with coronary pathologies in Brazil as of 2017[8].

The best damage control measure is to minimize the total ischemic time (TIT), with a target time of up to 90 minutes, counted from the onset of symptoms until the entry into the hospital, a metric adopted by institutions such as the American Heart Association[9]. According to data from the Brazilian Society of Cardiology (SBC), 40 to 65% of deaths by AMI occur in the first hours of manifestation. However, only 20% of patients arrive at the emergency sector within two hours after the onset of the clinical condition [10].

The main and most complicated evolution of AMI are arrhythmias with a cardiorespiratory arrest rhythm (CRA). This etiology is responsible for approximately 75% of out-of-hospital CRA cases[11]. Given this complication, it is necessary to adopt measures that provide a beneficial impact, directly interfering with the pre-hospital phase of AMI, e.g., public health policies and health education programs aimed at the early identification of the clinical condition of AMI; widespread Basic Life Support training (BLS); policies aimed at improving the structure of mobile emergency care; and the availability of automated external defibrillators in public spaces with large circulation of people[10].

Aiming to solve this problem, the Brazilian government, through Ordinance No. 1,864, of September 29, 2003, established the Mobile Emergency Care Service (SAMU), with the purpose of offering early assistance to victims, reducing morbimortality and increasing patient survival, in addition to organizing the emergency care flow [12].

However, SAMU, as a policy tool considered new - National Emergency Care Policy (PNAU), established by Ordinance no. 1,863, of September 29, 2003 – still faces some obstacles that need to be solved

in order to achieve a better assistance provided by this service[13]. These obstacles include dissatisfaction with the service's management, issues with the regulation center, the absence of periodical maintenance in ambulances, and lack of knowledge among the population about the SAMU service[13].

According to the American Heart Association[14], the prehospital care system is organized into three levels: first, the structure – consisting of people, health education, and equipment for intervention; second, the processes – involving the protocols, policies, and procedures; and third, the system – which involves programs, organization, and culture. These three levels are directly related to case's outcome, i.e., how the patient will evolve given an emergency medical situation. With that in mind, it is crucial to have a solid structure, with qualified processes contributing to the formation of a competent system and generating beneficial evolutions, with satisfaction, quality, and safety.

Given the facts mentioned before, studies on the infrastructure of SAMU, popular knowledge about BLS, and the application of practices aimed at prehospital care, e.g., bill No. 4,050, of 2004, which addresses the obligation to equip places with a high flow of people with semi-automated external defibrillators, contribute to identifying possible flows in the system, in addition to proposing measures that promote the service's implementation and improvement. Therefore, the present study aimed to evaluate the population knowledge about BLS and characterize the SAMU service with regard to its profile, structural support, and response time in a municipality of northeastern Brazil.

Materials and Methods

The study followed all recommendations and ethical principles mentioned by Resolution No. 466/12 of the National Health Council, with approval by the Ethics and Research Committee of the Rio São Francisco University Center, under protocol number 4,563,152. In order to ensure the ethical research procedures, a free and informed consent form (TCLE) was used for data collection via Google Forms. The study had a descriptive, quantitative approach, with a cross-sectional experimental design. The participants were individuals who lived in the municipality of Paulo Afonso, Bahia, and data collection occurred from May 7 to September 22, 2021.

The municipality of Paulo Afonso is located in the State of Bahia, in the semi-arid region of Brazil, with an area of 1,545 km^2 and an estimated population of 118,526 inhabitants[15]. The study was conducted with local individuals who answered the questionnaire made available digitally. The inclusion criteria were: age of 18 or higher; both sexes; residents of the municipality of Paulo Afonso-BA who were willing to answer the questionnaire applied and agreed in participating of the study after signing the TCLE. No exclusion criterion was adopted. During the sampling period, 106 answers were obtained.

The data were collected using an electronic form (Google Forms) that contained seven objective and 10 subjective questions used to measure the participants' knowledge about BLS practices and the appropriate identification of acute coronary syndrome cases, as well as their management in emergency situations. Next, the form was made available on different social media, e.g., Instagram and WhatsApp groups, and local news websites.

Furthermore, the study also included secondary data from SAMU regarding the infrastructure conditions and the processing of the mobile care service. The SAMU data were collected from the answers to a form send to the service's coordination.

The database was constructed using the software Microsoft Excel 2016. The statistical analyses were performed using

the software SPSS for Windows, version 21.0. The data were analyzed by descriptive statistics and the chi-square test of association (χ^2), and the results were considered statistically significant when $p < 0.05$.

Results

The results shown below include the analysis of the data referring to 106 participants who answered the virtual questionnaires. Of the 106 respondents, 75 (70.8%) were young adult individuals aged from 18 to 29 years. The study had higher female participation, with 78 respondents (73.6%).

Of the participants, 41 (38.7%) had already participated of a first aid course. However, only 15 (14,3%) ever saw or had contact with an automated external defibrillator. Furthermore, 91 participants (85.8%) correctly answered SAMU's dial number.

Table 1. Demographic and knowledge characteristics of the participants about basic life support.

Variable	n (%)
Sex	
Male	28 (26.4%)
Female	78 (73.6%)
Age (years)	
18-29	75 (70.8%)
30-39	10 (9.4%)
40-49	12 (11.3%)
≥ 50	9 (8.5%)
First aid course	
Yes	41 (38.7%)
No	65 (61.3%)
Have you ever seen an AED?*	
Yes	15 (14.3%)
No	90 (85.7%)
Do you know SAMU's dial number?	
192	91 (85.8%)
Others	15 (14.2%)
Total	**106 (100%)**

AED = automated external defibrillator; SAMU = Mobile Emergency Care Service. *Data unavailable for a participant. Source: The authors, 2021.

In the form with objective questions about BLS and first aid related to AMI, the specific knowledge about the chain of survival (CS) proposed by the American Heart Association was tested[14]. The item referring to recognizing an unconscious victim, first link of the chain, had a total of 16 (15.1%) hits, whereas the recognition of signs and symptoms had a total of 34 (32.1%) hits. The least recognized signs and symptoms of AMI were irradiation to the neck, nausea, and vomiting. The recognition of a case of CRA had a total of 45 (42.5%) hits. Finally, the item that evaluates the sequence to be followed after a CRA event reached a total of 49 hits (46.2%).

The second CS link refers to cardiopulmonary resuscitation. The item that evaluates the knowledge about effective compressions had a total of 26 (24.5%) hits. The third item of the CS, which refers to early defibrillation, had a total of (69.8%) hits. Furthermore, the knowledge about the pathology of AMI was also evaluated, reaching 57 (53.8%) hits.

Table 2. Questionnaire about basic life support and first aid in acute myocardial infarction.

Question	n (%)
1. After making sure the location is safe, what is the first action that should be taken to provide assistance to an unconscious victim?	
Check breathing and pulse (see if the person is breathing and has a pulse).	47(44.3%)
✓ Check if the person responds when called. (C)	16 (15.1%)
Call SAMU*	40 (37.7%)
I don't know.	3 (2.8%)
2. Do you know what 'acute myocardial infarction' is?	
That's when the heart stops beating.	5 (4.7%)
✓ It is when an artery in the heart becomes obstructed (clogged) and a wall of the heart begins to die. (C)	57 (53.8%)
This is when lipids (cholesterol/fat) adhere (stick) to the arteries of the heart, reducing the flow (passage) of blood.	22 (20.8%)
I don't know.	22 (20.8%)
3. Of the symptoms described below, which fits a hypothetical diagnosis of acute myocardial infarction?	
Chest pain; pain in the left arm; cold sweat; intense fear.	43 (40.6%)
Chest pain; pain in the neck and teeth; nausea and vomiting.	2 (1.9%)
Chest pain; tingling in the hand and face; feeling of shortness of breath; anxiety.	27 (25.5%)
✓ All alternatives. (C)	34 (32.1%)
4. Thoracic compressions should be performed:	
At a frequency of 50 to 100 per minute.	18 (17%)
With a compression: ventilation ratio (mouth-to-mouth breathing) of 30:1.	28 (26.4%)
✓ At a frequency of 100 to 120 per minute. (C)	26 (24.5%)
I don't know.	34 (32.1%)
5. Cardiorespiratory arrest can be easily diagnosed by:	
The victim's loss of consciousness, weak breathing, and no heartbeat.	27 (25.5%)
Severe chest pain, difficulty breathing and blurred vision.	18 (17%)
✓ Irresponsiveness of the victim, absence of breathing and absence of pulse in large arteries. (C)	45 (42.5%)
I don't know.	16 (15.1%)
6. The sequence that must be followed after making sure that the patient is in current cardiac arrest is?	
Check responsiveness; check the pulse; start chest compressions; call for help.	37 (34.9%)
Call for help; use the defibrillator; post-resuscitation care.	3 (2.8%)
✓ Call for help; start chest compressions early; defibrillation; post-resuscitation care. (C)	49 (46.2%)
I don't know.	17 (16%)
7. Do you know when an automated external defibrillator is used?	
✓ Heart arrest (C)	74 (69.8%)
Arrhythmias	7 (6.6%)
Respiratory failure	4 (3.8%)
I don't know	21 (19.8%)

Legend: the correct answers are signaled with the letter C.
*Although being a correct alternative, it is not the first step to be taken, according to the AHA chain of survival. Confirming the victim's responsiveness prevents unnecessary calls to SAMU. SAMU = Mobile Emergency Care Service. Source: The authors, 2021.

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It was possible to identify an association between the variables "carrying out first aid training" and the item that evaluates the quality of cardiopulmonary resuscitation (CPR) ($\chi^2 = 5.251$, $p = 0.022$). There was also an association between carrying out first aid procedures and the correct diagnosis of CRA ($\chi^2 = 5.095$, $p = 0.024$).

Finally, the secondary data from SAMU, referring to the fourth link of CS, revealed that cardiovascular emergencies are the most prevalent situations of SAMU's clinical care in Paulo Afonso. Service response time is 10 to 15 minutes. The service also counts on three mobile units, two basic and one advanced, serving, on average, 42 daily calls, of which 7% are prank calls. The service also counts on two defibrillators, one in the advance unit and a spare one (Table 3).

Table 3. Secondary data from the Mobile Emergency Care Service referring to the response time, average number of calls and prank calls, number of units, and automated and non-automated defibrillators.

SAMU secondary data	
Response time (from the call to the arrival at the scene)	10 to 15 minutes
Most prevalent situations	1st - Trauma 2nd - Cardiovascular emergencies 3rd - Obstetric emergencies
Average calls	
Daily	42 calls
Annual	15,300 calls
Average prank calls	
Daily	3 (7.0%)
Annual	1,113 (7.2%)
Number of units	
USB	2
USA	1
AED availability	Not available
Defibrillator availability	1 (USA)

USB = basic support unit; USA = advanced support unit; AED = automated external defibrillator; SAMU = Mobile Emergency Care Service. Source: The authors, 2021.

Discussion

The first CS link was identified in the present study through questions 1, 3, and 5, and in all of them the result was lower than 50% of hits. These results are similar to those found in a study carried out with lay people, employees of a University Center in the State of Bahia, in which 67.7% of the participants did not know what basic life support was and 61.5% did not feel prepared to act in emergency cases[16].

Based on the questions evaluated, the first one investigated the initial approach to an unconscious victim. At this moment, the priority attitude is to check whether the victim responds when called and not to check the pulse, considering that even well-trained professionals may have difficulties in determining asystole [11]. The third question refers to knowledge about the signs and symptoms of AMI, which can evolve into CRA. In this question, it is possible to observe that some symptoms considered typical are poorly recognized among the general population, e.g., nausea and vomiting. It should be noted that an early recognition of symptoms is directly

related to the victim's prognostic, both to avoid complications, e.g., CRA, and to increase survival[17].

This knowledge is essential for the general population, who needs to provide assistance in out-of-hospital situations. However, studies have demonstrated scenarios different from the ideal[18]. In a study with a lay population composed of 240 participants, it was verified that 64% of the interviewees could not identify the time to check the pulse and recognize a cardiorespiratory arrest. With regard to the signs and symptoms of AMI, 42% of the interviewees indicated retrosternal pain, 24% indicated numbness with weakness in the arm and jaw, and 4% could not respond[18]. It should be noted that ischemic chest pain, known as Levine's sign, will not be necessarily present. In 80% of cases, most commonly in elderly patients, AMI can progress asymptomatically, or pain can occur in locations different than usual, e.g., the mandible, upper limbs, or even in the back[19].

After observing that the victim is unresponsive, it is necessary to call the emergency service. In the present study, 85.8% of the participants knew the correct SAMU telephone number. The verification of CRA was evaluated in the fifth question, which obtained a total of hits of 42.5%. A delay in any of these steps can result in a longer response time to the victim, significantly reducing the likelihood of survival[20]. The results revealed an association between undertaking first aid training and the recognition of a CRA event ($\chi^2 = 5.095$, $p = 0.024$), which highlights the importance of BLS, evidenced by several studies with a varied audience[21-23].

The second link of CS is represented by thoracic compressions. Among the interventions performed in CRA cases, compressions are one of the most important elements as they are directly related to coronary perfusion and the return of circulation[24]. The fourth question, related to RCP, had a total of 24.5% of hits, which demonstrates that the general population does not have basic knowledge about BLS. There was a significant association ($\chi^2 = 5.251$, $p = 0.022$) in the present study, demonstrating the importance of first aid training in order to perform quality CPR. The results of other studies corroborate these findings since, when evaluating the knowledge about BLS among lay people, only 26% of the respondents correctly answered the question related to the frequency of cardiopulmonary resuscitation [16].

The third link of CS, which addresses defibrillation, has the lowest NNT, i.e., for every five patients treated, one has a positive outcome. It is also known that, for every minute of CRA without defibrillation, the likelihood of survival decreased by 7 to 10%[25]. The odds of survival decrease in 10 minutes without defibrillation. It should be noted that the response time of SAMU in Paulo Afonso is from 10 to 15 minutes, which draws attention to the importance of bill No. 4050/04[6], approved in 2015[27], which addresses the availability of AED in public places with high people circulation, thus optimizing early defibrillation.

Studies on what an AED is and its functionality are necessary since less than 15% of people know its finality and how to use it, even though this device is crucial in the CS in order to reverse CRA[16]. On the other hand, our study showed that 69.8% of the individuals who answered the questionnaire knew about the function of an AED, although 85.7% had never seen or been in contact with one. This result demonstrates that, in addition to the device's availability, it is necessary to invest in health education in order for the general population to know how to use it. The health education process represents a fundamental tool for health promotion actions and damage prevention, which can be performed through existing health programs, e.g., the School Health Program, Family Health Strategy, and Health Gym, among others. Although first aid training is mandatory in Brazil since 2017 for teachers

of public and private schools, health education actions are still optional for other professionals and students[29,30].

However, it should be noted that this health education process needs to be continuous since about a third of the knowledge acquired in trainings about this subject will be lost after a year; after two years, if there are no updates, from 50 to 60% of the knowledge is lost[29]. The strategy suggested for the consolidation of this type of information is spaced learning, with a schedule of training sessions every few months to reinforce the teaching-learning process[29,30].

The SAMU response time differs greatly among the regions of Brazil, as various indicators can interfere with this factor, e.g., parameters associated with the service's structure (conservation status of the ambulances; overall physical structure; aspects related to geography, climate, traffic, and times; and availability of material resources), process (access to the service; guiding about the care service), and assistance result (severity of the patient; professional articulation)[28].

In order to reduce the SAMU response time, it is necessary to observe factors that might interfere with it, e.g., the number of care units, their distribution, and circulation conditions. However, these data are not always available since the SAMU is challenged by the absence of performance indicators and local studies that assist in the system's implementation[31]. The municipality of Paulo Afonso counts on a fleet of three ambulances located in the city's central area and in the Cardeal Vilela neighborhood, near downtown, which can affect the response time for occurrences in peripheral locations. In a review study on the characterization of care services provided by the SAMU, it was possible to identify a profile of clinical care followed by external causes (land accidents and trauma), cardiac, obstetric, psychiatric, respiratory and neurological care[32].

Another factor that can directly influence the response time are prank calls[33]. In Paulo Afonso, about 7% of daily calls are prank calls, which demonstrates the importance of measures such as the effectiveness of article 266 of the Brazilian Penal Code, which establishes detention from one to three years and a fine for such infractions. In case the infraction was committed by minors, they should be sent to the Children and Youth Court for socio-educational measures[34]. Furthermore, it is urgent to adopt educational measures aimed at offering BLS knowledge since childhood, an example of which is the 'Samuzinho' (Little SAMU) project created in Brazil's Federal District in 2007[35].

Prank calls are common in all regions served by SAMU, causing overload in the services of health professionals in these units, in addition to wasting resources. Despite the law establishes punishments for this type of occurrence, the suggested course action in order to change this scenario consists of health education initiatives and the creation of education programs so that the population can know the telephone numbers of emergency services and understand their function and the harms of prank calls for life preservation[32].

The main limitation of this study was the participants' adherence to it since most of the respondents were young, adult, female students. Furthermore, the number of participants was lower than the estimated, even with wide publicity. However, it was possible to find significant associations that highlight the need for a diffuse training aimed at the general population about BLS, in addition to the demand for more studies in order to ensure better prehospital care.

Conclusion

The results of the present study revealed that there is a lack of knowledge and training of the population about BLS, associated with ineffective measures against common emergency situations.

Furthermore, most of the population is unable to identify and manage signs and symptoms of AMI, in addition to never having seen an AED.

From this perspective, it is necessary to put into effect the existing legal mechanisms, e.g., the availability of AED in public places, the offer of mobile care units, and the maintenance of existing units in the municipality, in addition to mechanisms aimed at avoiding prank calls. Furthermore, it is crucial to promote education measures, providing the general population with basic knowledge about BLS since most CRA cases occur in the out-of-hospital environment.

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