Access times to health services in cases of myocardial infarction

Tempos de acesso a serviços de saúde face ao infarto do miocárdio

Andreia Santos Mendes[1]
Virgínia Ramos dos Santos Souza Reis[1]
Carlos Antonio de Souza Teles Santos[2]
Fernanda Carneiro Mussi[1]

Keywords
Health services accessibility; Public health nursing; Education, nursing; Myocardial infarction

Descritores
Acesso aos serviços de saúde; Enfermagem em saúde pública; Educação em enfermagem; Infarto do miocárdio

Submitted
May 13, 2016

Accepted
August 29, 2016

Corresponding author
Fernanda Carneiro Mussi
Doutor Augusto Viana Filho Avenue, unnumbered, *Campus* Universitário do Canela, 40110-060 Salvador, BA, Brazil.
femussi@uol.com.br

DOI
http://dx.doi.org/10.1590/1982-0194201600061

Abstract

Objective: To analyze the access times of men and women who are having a myocardial infarction to referral hospitals in cardiology and the correlation between them.

Methods: Cross-sectional research, involving 100 victims of a myocardial infarction who were interviewed at referral hospitals in cardiology. To analyze the data, descriptive and inferential statistics were used with statistical significance.

Results: The access times were long (decision to seek care, arrival to first health service, time in care network and admission to referral hospitals in cardiology), except for the transportation time, mainly for women. The decision time contributed more to the time it took to arrive at the first health service and the time in the care network contributed more to the time to arrive at the referral hospitals in cardiology.

Conclusion: The long time waiting for specialized care reflects the lack of structure of the health services and the long decision time reflects the participants' lack of recognition of the myocardial infarction.

Resumo

Objetivo: Analisar os tempos relacionados ao acesso de homens e mulheres com infarto do miocárdio a hospitais referência em cardiologia e a correlação entre eles.

Métodos: Pesquisa transversal, com 100 pessoas com infarto entrevistadas em hospitais referência em cardiologia. Dados analisados por estatística descritiva e inferencial, adotando-se significância estatística.

Resultados: Os tempos foram elevados (decisão para atendimento, chegada ao primeiro serviço de saúde, permanência na rede de atenção e admissão em hospitais referência em cardiologia), exceto o de transporte, sobretudo para mulheres. Houve maior contribuição do tempo de decisão na composição do tempo de chegada ao primeiro serviço de saúde e do tempo de permanência na rede na composição do tempo de chegada aos hospitais referência em cardiologia.

Conclusão: A longa espera por atenção especializada reflete a falta de estrutura dos serviços de saúde, e o tempo de decisão elevado reflete a falta do não reconhecimento do infarto pelos participantes.

[1]Escola de Enfermagem, Universidade Federal da Bahia, Salvador, BA, Brazil.
[2]Universidade Estadual de Feira de Santana, Feira de Santana, BA, Brazil.

Conflicts of interest: no conflicts of interest to declare.

Introduction

The myocardial infarction is the most common isolated cause of death in both sexes,[1] corresponding to more than 30% of the deaths in Brazil.[2] In studies related to myocardial infarction, gender specificities appoint differences in the occurrence and treatment of the coronary event.[3]

The benefits of myocardial reperfusion therapies are time-dependent[4] and can be used if the patient arrives quickly at the health service after the onset of the symptoms. Therefore, it is fundamental to know the times involved in the access to health services and associated factors.[5]

Overall, pre-hospital delay in case of infarction is defined as the period between the onset of the symptoms and the admission to a health service and can be divided in two main components.[6] The first is the decision time, the period between the onset of the symptoms and the decision to seek care, with influence from sociodemographic, clinical, cognitive, emotional and environmental factors. The second component is the period between the dislocation and the arrival to a referral service in cardiology for specific treatment. In this component, mainly the influence of the transportation means and the healthcare networks' possible response has been observed.[6] In addition, evidence exists that the gender can influence the medical conduct, in that women who receive interventions have reached a more advanced stage of the coronary disease.[7]

Nevertheless, depending on the configuration of the care network for myocardial infarction, with particularities according to the countries and regions, various time fractions can make up the period between the onset of the symptoms and the admission to a referral hospital in cardiology. Differently from other countries, where the user is admitted directly to specialized services,[8] in the public health network of Salvador, Bahia, Brazil, the admission to referral hospitals in cardiology, with access to hemodynamics and intensive care services, does not take place directly, as these services have no "open door" emergency service, but the access is mediated by regulation centrals. Hence, people with symptoms of a myocardial infarction have to be assessed at least at one health service for further regulation to these hospitals.

In this case, the different time components until the admission to a referral hospital in cardiology include the decision time (period between the onset of the symptoms and the decision to search a health service), the transportation time (period between decision to seek care and arrival to the first health service), time to arrive at the first health service (period between onset of symptoms and arrival at the first health service), time of stay in the healthcare network (period between arrival at first health service and admission to referral hospital in cardiology). Hence, the time to arrive at referral hospitals in cardiology corresponds to the period between the onset of the symptoms and the admission to a referral hospital in cardiology.

The lack of studies on the time male and female victims of myocardial infarction take to get access to referral hospitals in cardiology in different Brazilian regions evidences the need for further investigation. This knowledge can support nurses and other health professionals in the implementation of management and care practices, in the inpatient and outpatient context, with a view to optimizing the diagnosis and treatment of myocardial infarction. The delayed access reduces the possibility of effectively using myocardial perfusion therapies and increased the morbidity and mortality due to the disease.[9]

In view of the above, the general objective in this study was to analyze the access times of male and female victims of myocardial infarction to referral hospital in cardiology and the correlation between them.

The specific objectives were to: 1. To estimate the times for decision, transportation, arrival to the first health service, length of stay in the healthcare network and time to arrive at the referral hospitals in cardiology; 2. To verify the correlation between the decision and transportation times and the time to arrive at the first health service; 3. To verify the correlation between the time to arrive at the first health service and the length of stay in the care network and the time to arrive at the referral hospitals in cardiology.

Methods

Cross-sectional study developed at two large public referral hospitals in cardiology in Salvador, BA, for the admission of users referred by the State Regulation Central.

To calculate the sample size, the estimated prevalence of myocardial infarction (AMI) corresponding to 99/100,000 adults in Salvador/BA was used as a parameter.[10] The following were considered: total assumed population during data collection period=1,000; proportion in study population equal to 0.099; 5% significance level and 4% maximum desired error.[11] According to the calculation, the sample size would correspond to 99, but 100 individuals were included, in line with the following criteria: medical diagnosis of AMI; minimum hospitalization of 24 hours and maximum 20 days and without medical restrictions for the interview.

The data collection tool consisted of structured questions to characterize sociodemographic and clinical aspects and the health service access. The data were collected through interviews with the study participants, except for the medical diagnosis, which was consulted in the patient history and confirmed with the assistant physician, as well as the time and time of hospitalization at the study hospitals.

The sociodemographic data were analyzed by means of descriptive statistics. To analyze the association between sociodemographic variables and sex, Pearson's Chi-squared test was used. The times for decision, transportation, arrival at the first health service, length of stay in the healthcare network and arrival at referral hospitals in cardiology were analyzed by means of the geometric average and respective confidence interval (95% CI) due to the asymmetric distribution.

To analyze the correlations between the decision and transportation times and the time to arrive at the first health service and to analyze the correlations between the time to arrive at the referral hospitals in cardiology and the decision and transportation times and length of stay in the healthcare network, Pearson's correlation coefficient, and bivariate and multivariate linear regression models were used. The premises of normality, linearity and homoscedasticity were complied with. The data were analyzed in Stata version 11.0. Significance was set at 5% for all tests.

The study complied with the Brazilian and international standards for ethics in research involving human beings and was approved by the *Comitê de Ética em Pesquisa do Hospital Ana Néri* under process 11/09.

Results

As regards the sociodemographic characteristics of the sample, 71.0% were men, with a mean age of 58.7 years (sd 11.1) and 29.0% were women, with a mean age of 59.0 years (sd 12.1). The marital status married or living with a partner was predominant for men (81.7%) and women (58.6%). Nevertheless, more women were single, separated, divorced or widowed than men (p=0.016).

Most men (74.6%) and women (65.5%) came from Salvador/BA and the Metropolitan Region; a majority of men (73.2%) and women (65.5%) self-declared they were black and had a low education level (70.4% and 65.5%, respectively, had finished the first year of primary education). The monthly family income was up to three minimum wages for 62.0% of men and 65.5% of women. No significant proportional differences were found between the sexes and these variables.

All times were long, except for transportation, and longer for women (Table 1).

Table 1. Geometric average of times studies according to sex

Times in hours	Men		Women		**p-value
	GA	¶95% CI	GA	¶95% CI	
TD*	1.0	0.69-1.63	1.4	0.76-2.7	0.416
TT†	0.4	0.32-0.53	0.5	0.36-0.64	0.385
TAFHS‡	2.0	1.43-2.77	2.3	1.37-3.77	0.650
TSHCN§	31.2	23.56-41.30	48.2	31.07-74.69	0.087
TARHC‖	36.5	27.95-47.70	52.7	34.44-80.67	0.134

*TD - Decision time; †TT - Transportation time; ‡TAFHS - Time to arrive at first health service; §TSHCN - Length of stay in healthcare network; ‖TARHC - Time to arrive at referral hospitals in cardiology; ¶CI - Confidence interval; **p-value obtained through robust regression; GA - Geometric average

In tables 2 and 3, for the sexes, a strong linear correlation is observed between the decision time

and the time to arrive at the first health service. The correlation between the transportation time and the time to arrive at the first health service was weak for men (Table 2) and moderate for women (Table 3). These correlations were statistically significant.

In the bivariate linear regression model, a greater contribution of the decision time than of the transportation time to the time to arrive at the first health service was observed for the sexes, with statistically significant correlation. For men (Table 2), it was identified that, at each one-hour increase in the decision time, the time to arrive at the first health service extended by 0.72h (43min) while, at each one-hour increase in the transportation time, the time to arrive at the first health service increases by 0.49h (29min). The explanation coefficient of the adjusted decision time model (R^2=0.89) also provided the best explanation for the variation in the time to arrive at the first health service, as its magnitude exceeded the coefficient of the transportation time (R^2=0.14). For women (Table 3), it was verified that, at each one-hour increase in the decision time, the time to arrive at the first health service increased by 0.79h (47.4min) while, at each one-hour increase in the transportation time, the time to arrive at the first health service extends by 0.12h (7.2min). For women, the explanation coefficient of the adjusted decision time model (R^2=0.97) also provided the best explanation for the variation in the time to arrive at the first health service, as its magnitude exceeded the coefficient of the transportation time (R^2=0.40).

The multivariate linear regression model also showed the greater contribution of the decision time in the composition of the arrival time to the first health service. For men, it was identified that each one-hour increase in the decision time means an extension by 0.69h (41min) in the time to arrive at the first service, versus 0.28h (16.8 min) of the transportation time (Table 2). For women, each one-hour increase in the decision time means an increase by 0.72h (43min) in the arrival time to the first service versus 0.28h (16.8 min) of the transportation time (Table 3). The correlations between the

Table 2. Linear correlation and bivariate and multivariate linear regression model coefficients between outcome variable TAFHS and predictive variables (TD and TT) and between outcome variable TARHC and predictive variables (TD, TT and TSHCN)

Variables	Men			Men	
	Linear correlation	Bivariate linear regression		Multivariate linear regression	
	r¶ (p**)	COEF†† (SE‡‡) (p**)	R²§§	COEF†† (SE‡‡) (p**)	R²§§
Components of TAFHS*					
TD†	0.94(0.00)	0.72(0.03)(0.00)	0.89	0.69(0.03)(0.00)	0.94
TT‡	0.38(0.00)	0.49(0.21)(0.02)	0.14	0.28(0.06)(0.00)	
Components of TARHC§					
TD†	0.30(0.01)	0.18(0.07)(0.00)	0.09	0.06(0.00)(0.00)	0.99
TT‡	- 0.00[a](0.93)	-0.01(0.14)(0.94)	0.00	0.04(0.01)(0.00)	
TSHCN‖	0.99(0.00)	0.94(0.00)(0.01)	0.98	0.93(0.00)(0.01)	

*TAFHS - time to arrive at first health service; †TD - decision time; ‡TT - transportation time; §TARHC - time to arrive at referral hospitals in cardiology; ‖TSHCN - length of stay in healthcare network; ¶r: Pearson's Correlation Coefficient; **P-value based on Pearson's Correlation Test; ††COEF: Bivariate or Multivariate Linear Regression Model Coefficient; ‡‡SE: standard error; §§R²: Determination or Explanation Coefficient of Adjusted Model; [a]The value corresponds to -0.98,10^{-2} in scientific format; [b]The value corresponds to 0.53,10^{-2} in scientific format

Table 3. Linear correlation and bivariate and multivariate linear regression model coefficients between outcome variable TAFHS and predictive variables (TD and TT) and between outcome variable TARHC and predictive variables (TD, TT and TSHCN)

Variables	Women			Women	
	Linear correlation	Bivariate linear regression		Multivariate linear regression	
	r¶ (p**)	COEF†† (SE‡‡) (p**)	R²§§	COEF†† (SE‡‡) (p**)	R²§§
Components of TAFHS*					
TD†	0.98(0.00)	0.79(0.03)(0.00)	0.97	0.72(0.03)(0.00)	0.98
TT‡	0.63(0.00)	0.12(0.25)(0.00)	0.40	0.28(0.05)(0.00)	
Components of TARHC§					
TD†	0.45(0.01)	0.30(0.11)(0.00)	0.20	0.05(0.01)(0.00)	1.00
TT‡	0.32(0.09)	0.48(0.21)(0.02)	0.10	0.00[b](0.02(0.73)	
TSHCN‖	0.99(0.00)	0.97(0.00)(0.01)	0.99	0.94(0.00)(0.01)	

*TAFHS - Time to arrive at first health service; †TD - Decision time; ‡TT - Transportation time; §TARHC - Time to arrive at referral hospitals in cardiology; ‖TSHCN - Length of stay in healthcare network; ¶r: Pearson's Correlation Coefficient; **P-value based on Pearson's Correlation Test; ††COEF: Bivariate or Multivariate Linear Regression Model Coefficient; ‡‡SE: standard error; §§R²: Determination or Explanation Coefficient of Adjusted Model; [a]The value corresponds to -0.98,10^{-2} in scientific format; [b]The value corresponds to 0.53,10^{-2} in scientific format

predictive variables and the response variable were statistically significant. The explanation coefficient of the adjusted model (R^2) explained 94% of the composition of the arrival time to the first health service among men (Table 2), and 98% among women (Table 3).

In table 2, the linear correlation coefficient also revealed, for men, a weak, small and strong correlation between the decision time, transportation time and length of stay in the health network and the composition of the arrival time to the referral hospitals in cardiology, respectively. For women (Table 3), the decision and transportation times showed a weak correlation in the composition of the arrival time to the referral hospitals in cardiology, while the correlation with the length of stay in the healthcare network was strong. All correlations were statistically significant.

The bivariate linear regression model showed a greater contribution of the length of stay in the healthcare network to the composition of the arrival time to the referral hospitals in cardiology. For men, every one-hour increase in the length of stay in the healthcare network means an extension by 0.94h (56min) in the time to arrive at the referral hospitals while, for every one-hour increase in the decision time, the time to arrive at the referral hospitals in cardiology would increase by 0.18h (10,8min) and the transportation time by -0.01h (0.6min) (Table 2). For the women, it was verified that every one-hour increase in the length of stay in the health network means an increase by 0.97h (58min) in the time to arrive at the referral hospitals while, for every one-hour increase in the decision time, the time to arrive at the referral hospitals would increase by 0.30h (18min) and the transportation time by 0.48h (28,8min), (Table 3). The explanation coefficient of the adjusted model for the length of stay in the healthcare network also best explained the variation in the time to arrive at the referral hospitals in cardiology, with a coefficient superior to 0.90 and superior to the R^2 of the decision and transportation times in both sexes (Tables 2 and 3).

The multivariate linear regression model also showed greater contribution of the length of stay in the healthcare network in the composition of the time to arrive at the referral hospitals, for men as well as for women (Tables 2 and 3). For men (Table 2), it was identified that every one-hour increase in the length of stay in the health network means an extension by 0.93h (56min) in the time to arrive at the referral hospitals in cardiology, while every one-hour increase in the decision time and the transportation time means, respectively, an increase by 0.06h (3.6min) and 0.04h (2.4min) in the time to arrive at the referral hospitals in cardiology. For women (Table 3), it was identified that every one-hour increase in the length of stay in the healthcare network means an increase by 0.94h (56.4min) in the time to arrive at the referral hospitals in cardiology, while every one-hour increase in the decision time means an extension by 0.05h (3min) in the time to arrive at the referral hospitals in cardiology. The transportation time did not contribute to the increase in the time to arrive at the referral hospitals in cardiology. The explanation coefficient of the adjusted coefficient explained 99% of the composition of the time to arrive at the referral hospitals in cardiology for men (Table 2) and 100% for women (Table 3).

Discussion

The participants were predominantly men, as observed in other studies,[12,13] who suffered a myocardial infarction early (≤ 65 years),[14] were in poor socioeconomic conditions and spent more time in the healthcare network. Individuals in worse socioeconomic conditions experience more difficulties to access the health services.[15] The larger proportion of black participation is justified by the development of the study in a capital that concentrates the largest number of descendants of African ancestors in the country.[16]

The mean times investigated showed delay in the access to health services, mainly for women, which remains long.[6] Women may underestimate the risk of heart disease[17] and experience symptoms that are not always typical of the disease,[18] reasons that contribute to a greater delay.

The high mean decision time and its strong correlation with the time to arrive at the first health service strengthens the importance of understanding how men and women act in response to the symptoms. This understanding provides explanations for the delay to reach the hospital and points towards actions that can reduce this delay.[19] It is known that cognitive and emotional factors (interpretations, thoughts and actions in view of infarction symptoms) are associated with the delayed decision to seek care.[20] Educational activities by nurses should focus on these factors in order to optimize the search for care.

Despite the small contribution of the transportation time to the time to arrive at the first health service, it is important to keep this time as short as possible and to make infarction victims value the summoning of the emergency care service (SAMU) or visit an emergency service within their health district. The SAMU is recommended because it possesses human and material resources to administer initial care, contributing to reduce the pre-hospital delay.[6] The population needs orientation on the importance of summoning the service, which should readily respond to the calls. Educational strategies by nurses can be extremely valuable and can take place at primary care services, at home and at community centers.

In this study, long waiting times for admission and treatment at a specialized service were evidenced. The length of stay in the healthcare network was more strongly correlated with the time to arrive at the referral hospitals in cardiology for both sexes, strengthening the importance of a network that is shaped and structured to facilitate the access to specific points in the health system,[21] minimizing care delays.

The universalization of the access to health services has not fully taken place, with supply and organization problems.[15] The reality of access to the Unified Health System is unequal and excluding, with continuing problems in the different accessibility components, which can be associated with the retention of infarction victims in the service network, as shown in this study. The lack of structure of the public health hospitals is highlighted, such as the small number of clinical and surgical beds offered in cardiology. In addition, the response level of the emergency services has been insufficient, as highlighted in the Municipal Health Plan 2014-2017. Although these services aim to respond rapidly to the users and to counter-refer them to the other points in the healthcare network,[22] they face challenges in the work process, such as the overload of care in response to spontaneous demand in the primary health care services, diminished health teams, disarticulated work process, scrapping of the physical structure and referral and counter-referral difficulties.

In view of the delay to start specialized treatment, in December 2011, the Brazilian Ministry of Health acknowledged the importance of organizing care networks for myocardial infarction in metropolitan regions with a view to reducing the mortality rates in the country. The efficacy of these networks has been verified in international studies[23,24], as illustrated by a specific recommendation of the American Heart Association.[25]

Nevertheless, successful care delivery to infarction victims does not exclusively depend on the creation of care networks, but on raising the victims' awareness on the need to visit an emergency service early, on integrated efforts by the community, health professionals and managers, as well as on public policies focused on the organization and structuring of the care network, including equipment, material and qualified staff.

Conclusion

The access times to referral hospitals in cardiology were high, mainly for women. In relation to the transportation time, the decision time was more strongly correlated with the time to arrive at the first health service and the length of stay in the network, in comparison with the decision and transportation times, showed a better correlation with the time to arrive at the referral hospitals in cardiology. The study strengthens the importance of health education strategies with a view to infarction victims' recognition the gravity of the symptoms and the

valuation of an immediate visit to a health service. Moreover, it shows the need for a better quality of the emergency services' response in Salvador/BA.

Acknowledgements

This study is part of the matrix project "Pre-hospital delay in cases of myocardial infarction: gender differences" funded by the *Fundação de Amparo à Pesquisa do Estado da Bahia* (FAPESB) and coordinated by Prof. Fernanda Carneiro Mussi, Ph.D.

Collaborations

Mendes AS and Mussi FC contributed to the conception and development of the research phases, writing of the article, compliance with journal standards and approval of final version for publication. Reis VRSS contributed to the conception and development of the research phases and Santos CAST collaborated with the conception, analysis and interpretation of the data.

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