

Acute Myocardial Infarction in the Brazilian State of São Paulo. In-hospital Deaths from 1979 to 1996 and Hospital Fatality from 1984 to 1998 in the Public Health System

Luiz Francisco Marcopito, Artur Jaques Goldfeder, Simone Schenkman

São Paulo, SP - Brazil

Objective - To determine the following parameters in the Brazilian State of São Paulo: 1) the percentage of deaths due to acute myocardial infarction (AMI) occurring in hospitals; 2) the percentage of deaths due to AMI occurring in public health system hospitals as compared with all in-hospital deaths due to AMI between 1979 and 1996; 3) the fatality due to AMI in public health system hospitals from 1984 to 1998.

Methods - Data were available on the Datusus Web site (the health information agency of the Brazilian Department of Health) that provided the following: a) number of deaths resulting from AMI in hospitals; b) number of deaths resulting from AMI in public health system hospitals; c) number of hospital admissions due to AMI in public health system hospitals.

Results - The percentage of in-hospital deaths due to AMI increased from 54.9 in 1979 to 68.6 in 1996. The percentage contribution of the public health system to total number of deaths due to AMI occurring in hospitals decreased from 22.9 in 1984 to 13.7 in 1996; fatality due to AMI occurring in public health system hospitals had an irregular evolution from 1984 to 1992 and showed a slight trend for increased frequency from 1993 to 1998.

Conclusion - The percentage of in-hospital deaths due to AMI has been increasing. Deaths resulting from AMI in public health system hospitals have decreased when compared with the total number of deaths due to AMI in all hospitals. Fatality due to AMI in public health system hospitals did not decrease from 1992 to 1998.

Keywords: acute myocardial infarction, ischemic heart disease, mortality, epidemiology

Decrease in the mortality rate due to acute myocardial infarction (AMI) observed in the Brazilian State of São Paulo¹ has followed the trend of the western world². Whether this results from a reduction in the incidence of the disease, or in the fatality rate, or from a combination of these³ is still a controversial matter. Reduction in fatality, however, in patients with AMI who arrive at hospitals has been highlighted in some parts of the world and attributed to the most recent pharmacological treatments⁴⁻¹⁰.

This study aims to assess fatality due to AMI in the Brazilian State of São Paulo by determining the following: a) whether, during the period of the study, a change in the percentage of in-hospital deaths due to AMI occurred; b) the percentage participation of the public health system hospitals in in-hospital deaths due to AMI; c) fatality due to AMI in public health system hospitals.

Methods

This study analyzed historical data gathered from the following secondary data sources: a) death certificates – in the state of São Paulo, this coverage is close to 100%; b) the quality of the information on the cause of death – in the state of São Paulo, deaths resulting from ill-defined causes represented only 6% in the period from 1979 to 1996¹²; c) access to a database – data, even though originating from different sources (SIH [Hospital Information System] and SIM [System of Information on Mortality]), were all available at one electronic address, Datusus (the health information agency of the Brazilian Health Department)¹²; and d) codification of AMI – for statistical purposes, AMI continues to be classified according to just one code, both by the 9th and 10th reviews of the International Classification of Diseases^{13,14}.

We determined the following parameters for both sexes and all ages: a) the percentage of in-hospital deaths due to AMI occurring from 1979 to 1996; b) the percentage of deaths due to AMI in public health system hospitals based

Escola Paulista de Medicina - UNIFESP and Divisão de Doenças Crônicas Não-Transmissíveis, Centro de Vigilância Epidemiológica "Prof. Alexandre Vranjac", Secretaria de Estado da Saúde de São Paulo
Mailing address: Luiz F. Marcopito - Rua Pedro de Toledo, 675 - 04039-032 - São Paulo, SP - Brazil.

Received on 2/4/99

Accepted on 9/8/99

on all deaths due to AMI occurring in hospitals from 1984 to 1996; c) hospital fatality due to AMI occurring in the public health system from 1984 to 1998, defined as the percentage of deaths in relation to the total number of hospital admissions due to AMI in the public health system. The periods of time differ only because of a problem in data availability. The private hospital system and the HMO system were not included in the study because of lack of official statistics.

The variables that generated this information, grouped by calendar year and the usual dwelling place of the patient/dead person, were the following: a) location of death – item number 10 on the death certificate¹⁵ or the “site of occurrence” was indicated by one of the following options: 1-) in-hospital; 2- on the street; 3- at home; 4- other locations; 0- location not provided; 9- location unknown; b) deaths due to AMI in public health system hospitals; c) hospital admissions due to AMI in the public health system.

Results

The percentage of in-hospital deaths due to AMI progressively and consistently increased during the period from 1979 to 1996 (from 54.9% to 68.6%) while a concomitant decrease in the percentage of deaths occurring at home place was observed (table I and fig. 1).

Among all in-hospital deaths due to AMI from 1984 to 1996, those deaths occurring in public health system hospitals decreased from 22.9% to 13.7% (table II and fig. 2).

Hospital fatality due to AMI in the public health system showed an irregular behavior in the period of the study. A significant increase occurred from 1984 to 1988, a decrease occurred from 1989 to 1992, and a new and slower increase occurred from 1993 to 1998 (table III and fig. 2). We can say that a reduction in hospital fatality due to AMI in the public health system did not occur in this latter period.

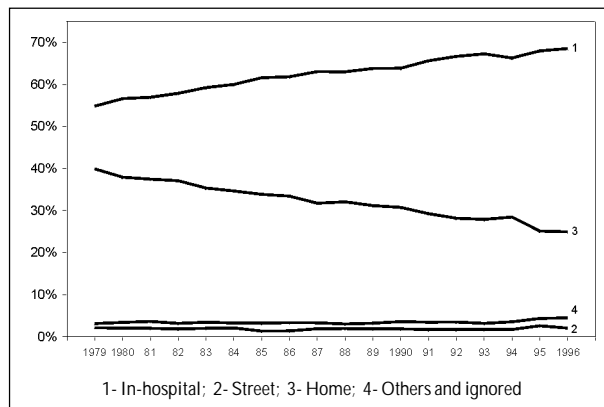


Fig. 1 – Relative distribution (%) of the locations of death occurrence due to AMI according to the calendar year 1979 to 1996 in the state of São Paulo.

Discussion

In the literature, there is a classic observation published in 1982 in the United States that 50% of the deaths due to AMI occurs prior to the patient’s arrival at the hospital¹⁶. As observed, in 1979 in the state of São Paulo, only 54.9% of the deaths due to AMI occurred in the hospital. Since then, a progressive increase in the percentage of in-hospital deaths due to AMI has occurred, reaching 68.6% in 1996.

This increase may have resulted from improvement in patients’ access to hospitals. However, we cannot ignore the possibility of a reduction in the number of fulminant cases, allowing a higher number of patients to reach the hospital before dying and to receive more modern treatments whenever available. Unfortunately, the total number of patients who benefited from the earlier hospital arrival could not be determined for the hospital network as a whole, due to lack of data outside the public health system.

Table I - Absolute distribution of the locations of death occurrence due to acute myocardial infarction (AMI) and percentage (%) of in-hospital deaths due to AMI according to the calendar year in the state of São Paulo from 1979 to 1996

Year	Location of death occurrence					Total	In-hospital %
	Hospital	Street	Home	Others	Ignored		
1979	6687	260	4865	365	14	12191	54.9
1980	7044	251	4718	398	24	12435	56.6
1981	7150	248	4706	431	21	12556	56.9
1982	7109	225	4556	382	5	12277	57.9
1983	7693	256	4589	430	13	12981	59.3
1984	7888	273	4555	421	6	13143	60.0
1985	8307	180	4566	408	25	13486	61.6
1986	8549	189	4623	452	10	13823	61.8
1987	9164	272	4616	466	12	14530	63.1
1988	9842	300	5009	450	16	15617	63.0
1989	9972	288	4871	474	24	15629	63.8
1990	10025	285	4832	510	48	15700	63.9
1991	10258	263	4572	493	43	15629	65.6
1992	10452	262	4419	535	9	15677	66.7
1993	10766	268	4462	499	3	15998	67.3
1994	10873	278	4664	571	6	16392	66.3
1995	11265	426	4162	671	44	16568	68.0
1996	12231	360	4453	729	69	17842	68.6

Table II - Number of deaths due to acute myocardial infarction (AMI) in public health system hospitals, total number of in-hospital deaths due to AMI, and respective percentage of deaths due to AMI occurring in public health system hospitals in relation to all in-hospital deaths due to AMI in the state of São Paulo from 1984 to 1996

Year	Number of deaths due to AMI occurring in public health system hospitals	Total number of in hospital deaths due to AMI	Percentage of deaths due to AMI occurring in public health system hospitals in relation to all in hospital deaths due to AMI
1984	1805	7888	22.9
1985	1728	8307	20.8
1986	1644	8549	19.2
1987	1827	9164	19.9
1988	2175	9842	22.1
1989	2171	9972	21.8
1990	1985	10025	19.8
1991	2137	10258	20.8
1992	2075	10452	19.9
1993	2083	10766	19.3
1994	1969	10873	18.1
1995	1809	11265	16.1
1996	1675	12231	13.7

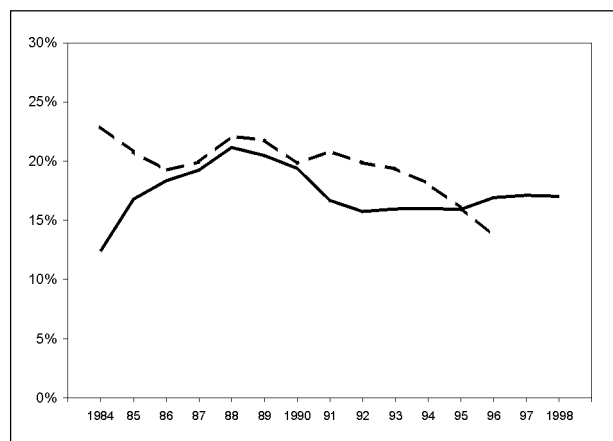


Fig. 2 - Percentage of deaths due to AMI in public health system hospitals in relation to the total of in-hospital deaths due to AMI from 1984 to 1996 (dotted line), and hospital fatality (%) due to AMI in the public health system from 1984 to 1998 (continuous line), according to the calendar year in the state of São Paulo.

This lack of information outside the public health system could be solved if all CAH-106 (Hospital Assistance Coordination) reports, which all hospitals in the state of São Paulo have to complete, were processed. This report comprises all diagnoses at hospital admission and discharge, independently of the category of payment (private, HMO or public health system). This information would be very useful to elucidate the reasons interfering with the reduction in the mortality rate due to AMI in the population of the state of São Paulo.

In the public health system, any interpretation of the official data regarding hospital fatality due to AMI requires caution. The increase observed from 1985 to 1988 may have been artificial, caused by the possibly inflated number of hospital admissions in 1984 (14,560 hospital admissions due to AMI, a figure 41.6% higher than the 10,285 hospital admissions in 1988). The numbers from 1989 to 1998 seem more reliable and, if true, they show a significant drop in

Table III - Number of deaths due to AMI in public health system hospitals, number of hospital admissions due to AMI in the public health system, and hospital fatality* due to AMI in the public health system in the state of São Paulo from 1984 to 1998

Year	Deaths due to AMI in public health system hospitals	Hospital admissions due to AMI in the public health system	Hospital fatality* due to AMI in the public health system
1984	1805	14560	12.4
1985	1728	10292	16.8
1986	1644	8965	18.3
1987	1827	9497	19.2
1988	2175	10285	21.1
1989	2171	10610	20.5
1990	1985	10241	19.4
1991	2137	12811	16.7
1992	2075	13186	15.7
1993	2083	13049	16.0
1994	1969	12316	16.0
1995	1809	11363	15.9
1996	1675	9906	16.9
1997	1641	9587	17.1
1998	1775	10428	17.0

* Hospital fatality due to AMI = (deaths among patients admitted to hospital due to AMI)/(total number of hospital admissions due to AMI).

fatality from 1989 to 1992 (from 20.5% to 15.7%) and a slight increase from 1993 to 1998 (from 16.0% to 17.0%).

Based on this last observation it can be said that patients with AMI arriving at public health system hospitals in the state of São Paulo from 1993 to 1998 did not benefit more than those arriving in 1992. Our hospital fatality statistics of more recent years are far higher than the 11.8% (in 1990) of a service in Sweden⁶ and the 9% (in 1992) of the city of Hamilton, in Canada⁷. On the other hand, they are close to the 16.3% (in 1991) of the Canadian province of Ontario⁸ and lower than the 20.2% (in 1991) in a British health district⁹.

Considering that hospital fatality due to AMI in the public health system has not decreased in the recent years, the marked reduction in in-hospital deaths due to AMI from 1993 to 1997 might have resulted from the decrease in hospital admissions due to AMI in the public health system.

The reduced and declining contribution of the public health system to the total of hospital deaths due to AMI diminishes the importance we thought this public health system had in the hospital network of the state of São Paulo as a whole. The authors were surprised to verify that in 1984 less than 23% of the in-hospital deaths due to AMI occurred in the public health system, and this percentage decreased to 13.7% in 1996. Therefore, at least regarding this cause of hospital admission and death, a more comprehensive system of information is required (processing of the CAH-106 reports) to provide data on what is really happening with hospital deaths due to AMI. Death due to AMI, as is already known, has been decreasing in various parts of the world according to population-based studies^{4,6-10}.

Data used in this study, even though secondary, are official.

References

1. Marcopito LF, Shirassu MM. Mortalidade por infarto agudo do miocárdio e pelas demais doenças isquêmicas do coração no Estado de São Paulo, 1980-1996. *Arq Bras Cardiol*, 2000 (in press).
2. Uemura K, Pisa Z. Trends in cardiovascular disease mortality in industrialised countries since 1950. *World Health Statist Q* 1988; 41: 155-78.
3. McGovern PG, Pankow JS, Shahar E, et al. Recent trends in acute coronary heart disease: mortality, morbidity, medical care, and risk factors. The Minnesota Heart Survey Investigators. *N Engl J Med* 1996; 334: 884-90.
4. Bata IR, Eastwood BJ, Gregor RD, et al. Decreasing mortality from acute myocardial infarctions: effect of attack rates and case severity. *J Clin Epidemiol* 1997; 50:787-91.
5. Rosamond WD, Chambless LE, Folsom AR, Cooper LS, Conwill DE, Clegg L, Wang CH, Heiss G. Trends in the incidence of myocardial infarction and in mortality due to coronary heart disease, 1987 to 1994. *N Engl J Med* 1998; 339: 861-7.
6. Dellborg M, Eriksson P, Riha M, Swedberg K. Declining hospital mortality in acute myocardial infarction. *Eur Heart J* 1994; 15: 5-9.
7. Le Feuvre CA, Connolly SJ, Cairns JA, Gent M, Roberts RS. Comparison of mortality from acute myocardial infarction between 1979 and 1992 in a geographically defined stable population. *Am J Cardiol* 1996; 78: 1345-9.
8. Naylor CD, Chen E. Population-wide mortality trends among patients hospitalized for acute myocardial infarction: the Ontario experience, 1981 to 1991. *J Am Coll Cardiol* 1994; 24:1431-8.
9. Greenbaum RA, Morris R, Sritara P, Shanit D, Chan KL. Reduced in-hospital mortality from acute myocardial infarction with general adoption of thrombolytic treatment in the North West Thames health region 1979-1991. *Br Heart J* 1995; 74: 493-6.
10. Ohara D, McDonald I. Trends in in-hospital mortality following acute myocardial infarction (AMI) in Victoria, 1987-1994. *Aust N Z J Med* 1997; 27: 431-6.
11. Ortiz LP. Tendências recentes da mortalidade em São Paulo. Informe Demográfico, Fundação SEADE. São Paulo, 1988; 21: 5-46.
12. Datasus, Ministério da Saúde (<http://www.datasus.gov.br>) - Informação Direta, 1999.
13. Organização Mundial da Saúde - Manual da classificação estatística internacional de doenças, lesões e causas de óbitos. Volume I, Centro da OMS para a Classificação de Doenças em Português. São Paulo, 1985: 815.
14. Organização Mundial da Saúde - Classificação estatística internacional de doenças e problemas relacionados à saúde. Volume I, Centro Colaborador da OMS para a Classificação de Doenças em Português. São Paulo, 1993: 1247.
15. Laurenti R, Mello-Jorge MHP. O atestado de óbito. Centro da OMS para a Classificação de Doenças em Português. São Paulo, 1996: 90.
16. National Center for Health Statistics - Advanced report of final mortality statistics. USPHS, DHHS 1982; 85: 1120.