Secular Trends in a Population with Ischemic Heart Disease Admitted to the Instituto do Coração in São Paulo

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Objective - To assess the clinical and demographic characteristics of a population with ischemic heart disease admitted in the final decades of the 20th century.

Methods - This study retrospectively assessed patients hospitalized with ischemic heart disease divided into the following 2 groups: acute group - 11,181 patients with acute myocardial infarction admitted from 1/1/82 to 12/31/94; and chronic group - 4,166 patients undergoing coronary artery bypass graft surgery from 1/1/84 to 12/31/94.

Results - In the acute group, an increase in the percentage of females (from 22.7% to 27.7%, P<0.001) and diabetic individuals (from 12.4% to 17.5%, P<0.001) was observed, as was an increase in age (from 57.4±11.5 to 59.9±12.1 years, P<0.05). In-hospital mortality was greater among females (27.8% and 15.7%, P=0.001), among diabetic individuals (24.2% and 17.8%, P=0.001), and among the elderly (60.9±15.2 and 57.7±11.8 years, P=0.0001). In the chronic group, an increase in the percentage of females (from 17.5% to 27.2%, P=0.001) was observed, as was an increase in age (from 56.3±8.6 to 60.5±9.6 years, P=0.0001). In-hospital mortality was greater among females (8.3% and 5.8%, P<0.05) and among the elderly (58.1±9.1 and 62.1±7.9 years, P=0.0001).

Conclusion - The characteristics of the population studied with ischemic heart disease point towards a worse prognosis, due to the greater percentages of females, older patients, and diabetic patients, groups known to have greater in-hospital mortality.

Keywords: ischemic heart disease, acute myocardial infarction, coronary artery bypass graft surgery
Methods

The present study retrospectively analyzed patients diagnosed with ischemic heart disease admitted to InCor with the acute and chronic forms of ischemic heart disease. Two groups of patients were defined as follows: acute – comprising patients aged 20 years or older diagnosed with acute myocardial infarction and admitted to the hospital from 1/1/82 to 12/31/94. The criteria used for diagnosing myocardial infarction were the same as those used in the World Health Organization MONICA Project 16, chronic – comprising patients diagnosed with ischemic heart disease and undergoing coronary artery bypass graft surgery. Only patients older than 20 years and admitted to the hospital from 1/1/84 to 12/31/94 were studied, and the diagnosis of ischemic heart disease met the classical clinical and cine coronary angiographic criteria of the national and international literature 17,18. In the latter group, the diagnosis of myocardial infarction was an exclusion criterion to prevent patients from being included in both groups.

In the acute group, the variables age, sex, and in-hospital mortality, and the presence of diabetes mellitus as an associated disease were analyzed. In the chronic group, the variables age, sex, and in-hospital mortality were analyzed. Information was retrospectively retrieved from the hospital databank. The medical records and statistics department of the hospital attributed a code to each diagnosis, according to the International Classification of Diseases (ICD-10) 19. In the acute group, only the diagnosis of acute myocardial infarction was analyzed, and, in the chronic group, only coronary artery bypass graft surgery was analyzed, patients diagnosed with myocardial infarction being excluded.

In regard to the statistical analysis, the classifying variables (sex, in-hospital mortality, and presence of diabetes mellitus) were descriptively presented in tables containing the absolute and relative frequencies. An initial exploratory analysis allowed the division into time periods according to the years of changes in frequencies. Data for the acute group were analyzed divided into the following 3 periods: 1992-1995, 1986-1990, and 1991-1994; data for the chronic group were analyzed divided into the following 3 periods: 1984-1985, 1986-1990, and 1991-1994. The chi-square test was used to compare proportions, and when the test was significant, the analysis was continued with the partition of the chi-square to determine the differences between the periods. The continuous variable age was descriptively presented in tables containing means, standard deviations, and minimum and maximum values; the means were compared using analysis of variance and the Tukey test, a multiple comparison procedure 20. The Student t test was used to analyze the relation between the variable age and in-hospital mortality, and the chi-square test and its partition were used for the other variables. In univariate analysis, the variables with statistical significance in regard to in-hospital mortality were used for adjusting a multiple logistic regression model with the stepwise selection method 20,21. The significance level adopted for this study was 0.05.

Results

Data obtained in the 2 groups are shown separately. Acute group – 11,181 patients were studied. The division of female patients into periods of relative frequency is shown in figure 1. No significant difference was observed between the periods 1982-1985 and 1986-1990 (P=0.13). However, a significant increase in the frequency of females with myocardial infarction was observed from period 1986-1990 to period 1991-1994 (P<0.001).

A significant increase in the number of patients diagnosed with diabetes mellitus in association with myocardial infarction occurred, and the division into periods is shown in figure 2. No significant difference was observed between the periods 1982-1985 and 1986-1990 (P=0.09). However, a significant increase in the frequency of patients diagnosed with the association of diabetes mellitus and myocardial infarction occurred from period 1986-1990 to period 1991-1994 (P<0.001).

A significant increase in the age of patients with myocardial infarction was observed in the periods analyzed. No significant difference between the periods 1982-1985 (57.4 years) and 1986-1990 (57.4 years) occurred. However, a significant increase in the age of patients with myocardial infarction was observed from the period 1986-1990 (57.4 years) to the period 1991-1994 (59.9 years, P<0.05) (fig. 3).

The analysis of the relation between the variables age and sex revealed that females were older than males (62.3±13 and 57±12.1 years, respectively, P<0.001). Table I shows the variables age, sex, and presence or absence of diabetes in absolute and relative numbers regarding the 3 periods analyzed.

The relation between the variable in-hospital mortality
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and each of the other variables studied was analyzed. The univariate analysis revealed greater coefficients of in-hospital mortality due to myocardial infarction among females (27.8% vs 15.7%, P=0.001), older patients (mean age of 60.9 years in deceased patients versus 57.7 years in survivors, P=0.0001), and in patients with diabetes mellitus (P=0.001) (fig. 4). In the multiple logistic regression model, only the variables sex and age had statistical significance in regard to in-hospital mortality (P=0.0001, odds ratio of 0.528, confidence intervals of 0.476 – 0.585 and 1.012 – 1.020, respectively).

Chronic group – 4,166 patients were studied and a significant increase in the age and number of females was observed from period 1984-1985 (56.3 years) to period 1986-1990 (58.4 years) and from period 1986-1990 to period 1991-1994 (60.5 years, P<0.05) (fig. 6). Table II shows the variables age and sex in absolute and relative numbers in regard to the 3 periods analyzed.

Greater coefficients of in-hospital mortality were observed among females (8.3% vs 5.8%, P=0.007) and the elderly (mean age of 62.1 years in deceased patients versus 58.1 years in survivors, P=0.0001). In the multiple logistic regression model, age was the only variable with statistical significance in regard to in-hospital mortality (P=0.0001, odds ratio of 1.053, confidence interval of 1.038-1.069).

Discussion

This study revealed a significant increase in the age and number of females among the patients with the acute and chronic forms of ischemic heart disease. This study
also corroborated the findings of previous studies, in which females were older than males.\(^7,^8,^{22}\)

The preoccupation with the changes in the characteristics of the population diagnosed with ischemic heart disease has been reported in the literature, and some of the studies are discussed below.

Naylor and Chen,\(^5\) in a study with 110,979 patients to determine the tendencies of in-hospital mortality due to myocardial infarction, analyzed data from all general hospitals in Ontario, Canada, in the years 1981, 1983, 1985, 1987, 1989, and 1991. The distribution of the patients according to sex and age revealed a variation in age over the decade. An increase in the number of patients with myocardial infarction in the age groups 70-79 and > 80 years was observed (from 25.1% to 28%, and from 12.4% to 17.3%, respectively). On the other hand, a decrease in the number of females with myocardial infarction in the age group 50-59 years was observed (from 22.1% to 16.7%). During the same period, the percentage of females increased from 34.3% to 35.7%. That multicenter study comprising the entire population of patients with myocardial infarction in a Canadian region has corroborated the findings in our population.

Similar results were reported by Diegues et al.\(^11\) analyzing the population of patients with myocardial infarction admitted to the Instituto Dante Pazzanese of Cardiology in São Paulo in different periods from 1973 to 1996. The authors reported a progressive increase in the mean age of myocardial infarction presentation from 53.3 to 60 years and in the percentage of females from 10.7% to 29%. No significant variation in the presence of diabetes mellitus as an associated disease in that population was observed.

In regard to the chronic form of ischemic heart disease, Pepine et al.\(^12\) studied a population of 5,125 patients with chronic stable angina in 1990 and reported the predominance of females (53%) with an elevated mean age greater than that of males (70.8 vs 67.2 years). In comparison with previous studies, the authors concluded that the characteristics of the population with chronic stable angina have been changing, and that, independent of the causes involved, that information is important for understanding the natural history of the disease and for selecting the appropriate diagnostic and therapeutic strategies.

No study about the secular trends of the characteristics of the population undergoing myocardial revascularization has been found in the literature. Although Pepine et al.\(^12\) studied a different population and did not analyze other time periods, their study confirmed our findings in patients with the chronic form of ischemic heart disease undergoing that procedure.

Several studies have reported the occurrence of a reduction in the incidence of ischemic heart disease, and some authors have suggested that this reduction is smaller in the female sex.\(^1,^{23}\) This fact could account for the findings in this and other studies regarding the increase in the percentage of females with ischemic heart disease. The tendency towards a smaller reduction in smoking in the female sex as compared with that in the male sex (observed in the last Brazilian census) and the growing participation of females in the job market could relate to these data.

On the other hand, the aging of the population detected in the final decades and the consequent increase in the inci-

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### Table II - Division into time periods of the variables sex, age, and the presence of diabetes in the chronic group

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Female</td>
<td>197 (17.5%)</td>
<td>369 (17.9%)</td>
<td>269 (27.2%)</td>
</tr>
<tr>
<td>Male</td>
<td>925 (82.4%)</td>
<td>1687 (82%)</td>
<td>719 (72.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>1122</td>
<td>2056</td>
<td>988</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
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<tr>
<td>56.3 ± 8.6</td>
<td>58.4 ± 8.7</td>
<td>60.5 ± 9.6</td>
<td></td>
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<tr>
<td>(26 - 79)</td>
<td>(29 - 81)</td>
<td>(33 - 82)</td>
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* p < 0.001

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Fig. 5 - Division into time periods of the relative frequencies of the female sex in the chronic group.

Fig. 6 - Age (in years) means and standard deviations in the chronic group divided into time periods.
dence of diseases of aging, known as epidemiological transition, is a continuous process and can explain in this population, as well as in other populations studied, the increase in the percentage of patients of more advanced age groups 2-4.

Diegues et al 11 reported no significant changes in the prevalence of diabetes mellitus in patients with myocardial infarction at the Instituto Dante Pazzanese of Cardiology in São Paulo from 1973 to 1996.

In a larger population, our study showed a significant increase in the incidence of diabetes in association with myocardial infarction during the period from 1982 to 1994. Changes in the age profile could contribute to the greater frequency of that association, because diabetes is the most prevalent disease in the older segments of the population 12. This finding has important clinical implications, because the greater prevalence of diabetes as a comorbidity in ischemic heart disease is associated with a greater number of complications and a more prolonged hospitalization, which was observed in the acute group. In the latter group, the diagnosis of diabetes associated with myocardial infarction relates to higher in-hospital mortality rates.

A significant change in in-hospital mortality in the period studied was observed only in the acute group. However, no tendency in the behavior of that variable was observed.

The analysis of the relation between in-hospital mortality and the other variables studied revealed greater rates among females and the elderly. In the acute group, the presence of diabetes mellitus as an associated diagnosis related to a greater in-hospital mortality. However, when considered together in the multiple logistic regression model, only the variables sex and age for the acute group and age for the chronic group had an association with greater in-hospital mortality rates.

Greater in-hospital mortality rates due to myocardial infarction have already been reported in female patients, in the elderly, and in diabetic patients 7-10,24. In our study, sex and age were associated with greater coefficients of in-hospital mortality in multivariate analysis. However, the greater influence of age (odds ratio = 1.016) suggested that, at least partially, the greater in-hospital mortality rate in females may be explained by the fact that these patients are older 25,26. The diabetes mellitus variable was not statistically significant in the multivariate analysis, suggesting that the increase in mortality among diabetic patients may be secondary to an increase in the percentage of older patients, among whom the disease is more prevalent.

In conclusion, all these findings point to a change in the profile of the population with ischemic heart disease admitted to InCor during the period studied, indicating a poorer prognosis associated with greater morbidity and mortality rates. This suggests that in the final decade of the 20th century, the patients became older, more females were affected, and the prevalence of diabetes mellitus increased.

Our study also confirms the findings of previous studies regarding the greater in-hospital mortality due to ischemic heart disease in females, in the elderly, and in patients with diabetes mellitus as an associated disease. Despite these results, no change in in-hospital mortality was observed during the study period. The recent advances in treatment and prevention of ischemic heart disease may have somehow compensated for the changes in the patients’ characteristics.

References

Bula resumida – MICARDIS

**Uso adulto**

**Forma farmacêutica e apresentações:** Comprimidos de 40 mg e 80 mg de hidroclorotiazida. MICARDIS é indicado em pacientes cuja pressão arterial é inadequadamente controlada com teofilina ou hidroclorotiazida isoladamente. Posologia: MICARDIS deve ser administrado uma vez ao dia, com ou antes de uma refeição. A dose de MICARDIS pode ser aumentada gradualmente, de 40 mg para 80 mg ou de 80 mg para 160 mg, a cada 4 a 6 semanas, até atingir a pressão arterial desejada ou até o limite máximo de 160 mg. MICARDIS pode ser administrado com outros anti-hipertensivos. MICARDIS HCT deve ser administrado com ou sem alimentos. Uso em mulheres grávidas e lactantes: MICARDIS HCT deve ser administrado apenas durante a gravidez e lactação em casos em que haja uma indicação clara de eficácia do medicamento. Precauções: MICARDIS deve ser administrado com ou sem alimentos. Nos pacientes com disfunção renal grave. Nos casos leves a moderados, não se observaram efeitos adversos renais e não é necessário ajuste de dose. Recomenda-se monitoração periódica da função renal. Nos casos de disfunção renal grave e hipertrofia obstrutiva renal, devido ao efeito antagônico, o uso de MICARDIS HCT deve ser evitado. Precauções: MICARDIS HCT deve ser administrado com ou sem alimentos. Contraindicações: Hipersensibilidade ao alopurinol. Os efeitos hiperglicêmicos dos beta-bloqueadores e diazóxido podem ser aumentados pelas tiazidas. Os agentes anti-inflamatórios (por exemplo, ibuprofeno) podem reduzir o efeito anti-inflamatório de MICARDIS. Recomenda-se a monitoração periódica dos níveis séricos de potássio, creatinina e ácido úrico. A aerossol de MICARDIS HCT deve ser administrada durante o intervalo de tempo de 30 minutos após o uso de diuréticos, devido à possibilidade de hiperpotassemia induzida por diuréticos. Além disso, devido à introdução de telmisartan no mercado, relataram-se casos raros de eritema, urticária, rinite ou angioedema. Tais reações ocorreram durante o uso de teofilina ou teofilina isoladamente. O tratamento concomitante de teofilina ou teofilina isoladamente deve ser evitado. Precauções: Hipertensão renovascular: A administração de teofilina ou teofilina isoladamente pode causar distúrbios eletrolíticos no feto e é possível que ocorram outras reações. Relataram-se casos de trombocitopenia ou icterícia neonatal com o tratamento tiazídico materno. Tiazidas são excretadas no leite e podem causar aumento da bilirrubina plasmática. As tiazidas podem aumentar o número de eventos adversos da amiantada. As tiazidas podem reduzir a hidrocortisona aos níveis séricos de cálcio e magnésio. Interações medicamentosas:

**Interações medicamentosas:**

- Relataram-se aumentos reversíveis das concentrações séricas de lítio durante administração concomitante com inibidores da enzima conversora da angiotensina (IECA) e hipotensores de ação central.
- MICARDIS pode reduzir o efeito anti-inflamatório de MICARDIS. Recomenda-se a monitoração periódica dos níveis séricos de potássio, creatinina e ácido úrico. A aerossol de MICARDIS HCT deve ser administrada durante o intervalo de tempo de 30 minutos após o uso de diuréticos, devido à possibilidade de hiperpotassemia induzida por diuréticos. Além disso, devido à introdução de telmisartan no mercado, relataram-se casos raros de eritema, urticária, rinite ou angioedema. Tais reações ocorreram durante o uso de teofilina ou teofilina isoladamente. O tratamento concomitante de teofilina ou teofilina isoladamente deve ser evitado. Precauções: Hipertensão renovascular: A administração de teofilina ou teofilina isoladamente pode causar distúrbios eletrolíticos no feto e é possível que ocorram outras reações. Relataram-se casos de trombocitopenia ou icterícia neonatal com o tratamento tiazídico materno. Tiazidas são excretadas no leite e podem causar aumento da bilirrubina plasmática. As tiazidas podem aumentar o número de eventos adversos da amiantada. As tiazidas podem reduzir a hidrocortisona aos níveis séricos de cálcio e magnésio. Interações medicamentosas: