Diseases of the Circulatory System Before and after the Family Health Program, Londrina, Paraná

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Abstract
Background: The reduction in morbidity and mortality rates from diseases of the circulatory system (DCS) is one of the greatest challenges in primary care, and the implementation of the Family Health Program provides access to the multisectoral and integrated measures required for dealing with these diseases.

Objective: To analyze DCS mortality and hospitalization rates before and after the implementation of the Family Health Program, in Londrina, Paraná.

Methods: This was an ecological study, comparing DCS, cerebrovascular disease (CbVD) and ischemic heart disease (IHD) mortality rates and hospitalization rates by the SUS, in residents of Londrina, in two 4-year periods: 1997 to 2000, and 2002 to 2005. The data were obtained from the Mortality Information System and the Hospital Information System of the SUS. The ratios between the rates were calculated for both periods at 95% confidence interval.

Results: The DCS was the first cause of death in the city, in both quadrennia. The CbVD and IHD accounted for more than 63% of DCS deaths. In comparing the two quadrennia, there was a reduction in CbVD mortality rates, which was significant only for subjects over 59 years, in both genders, and the hospitalization rates increased by 10%. For IHD, no significant change occurred in mortality rates, and there was a 40% increase in hospitalization rates.

Conclusion: The significant reduction only in CbVD mortality in the elderly suggests the need for expanding health assistance coverage to different population groups and the development of preventive and health promotion measures.

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Key Words: Cardiovascular diseases / mortality; morbidity; program evaluation.

Introduction
The technological and industrial revolution changed the morbidity and mortality profiles of the population, with a prevalence of diseases and deaths caused by non-transmissible chronic diseases (NTCD), resulting in high costs to society due to high mortality and early disability.

In Latin America and the Caribbean, NTCD is the main cause of death, and the most important diseases are those of the circulatory system - DSC, cancers and diabetes mellitus. In Brazil, in 2005, the DCS were responsible for 31.5% of deaths. Among these, cerebrovascular disease (CbVD) was the first cause of death, followed by acute myocardial infarction, which is the main disease among the group of ischemic heart diseases (IHD). In 2006, the DCS represented 10.1% of the total number of hospitalizations.

Both CbVD and IHD risk factors are well established. The Framingham study was among the first ones to demonstrate that hypertension, high cholesterol, obesity, diabetes mellitus, lack of physical activity and smoking habit are risk factors that are strongly related to the development of heart diseases and cerebrovascular diseases. After this one, several other studies confirmed this association.

All these risk factors are related in some way; therefore, the implementation of health care models that incorporate several strategies to prevent and/or control these factors, individually and collectively, is of fundamental importance in order to reduce DCS morbidity and mortality. This is, currently, one of the greatest challenges in basic health assistance.

The implementation of the Family Health Strategy as a policy priority for primary care, due to its configuration and work process, includes the most favorable conditions for accessing the integrated and multisectoral measures required for dealing with the DCS.

Given the importance of the DCS in the nosological framework in the country and the world, and considering the role of the family health teams in identifying and controlling major DCS risk factors, the purpose of this study is to analyze mortality rates and hospitalization rates by SUS, before and after the implementation of the Family Health Program, in Londrina, Paraná.
Methods

This was an ecological study, which compared mortality rates and hospital admissions for DCS, IHD and CbVD among individuals residing in the municipality of Londrina, in two four-year periods: from 1997 to 2000, and from 2002 to 2005, respectively before and after the implementation of the Family Health Strategy. The year 2001 was excluded because it was the year of the implementation of this strategy in the urban area of the municipality.

The city of Londrina is situated in the northern region of Paraná State. In 2005, it had a population of 488,287 inhabitants. In the same year, its network of primary care consisted of 54 health care units, with 102 teams linked to the Family Health Program, with a coverage of over 70% of the population of the municipality, especially from remote areas with greater epidemiological and social risk.

The mortality and hospitalization data were obtained from the data bank of the Mortality Information System (SIM) and the Hospital Information System of the Unified Health System (SIH/SUS). These data banks were made available to us by the Department of Information and Computer Science of SUS (DATASUS), an agency which is under the responsibility of the Executive Secretary of the Ministry of Health. The population data source was the Brazilian Institute of Geography and Statistics (IBGE); the population count for 1996 and the population estimates for 1997-1999, the 2000 Census (first quadrennium) and the Census estimates for 2000 to 2002-2005 (second quadrennium).

The data collection and classification conducted by the Information Systems of the Ministry of Health on morbidity and mortality from diseases of the circulatory system were based on the International Statistical Classification of Diseases and Related Health Problems - Tenth Revision of the International Classification of Diseases (ICD-10), Chapter IX. For the number of admissions in 1997, we used the ICD-9 (Chapter VII), which was the classification in force at that time. The DCS were grouped by the codes ICD-9 390 to 459 and ICD-10 100 to 199. The CbVD were grouped by the codes ICD-9 430 to 438 and ICD-10 160 to 169. And the IHD were grouped by the codes ICD-9 419 to 414 and ICD-10 120 to 125.

The data were transferred to an Excel spreadsheet, and specific rates were calculated according to the variables gender, age, cause of death and hospitalization. Gross rates of mortality and hospitalization for DCS, CbVD and IHD were used instead of standardized rates, considering the similarity in the population structure of the municipality in both periods. According to Laurenti et al., standardization is a resource to be used in the comparison of populations with different age structures.

For comparison of rates before and after the implementation of the Family Health Program, we calculated the ratios of mortality and hospitalization at the 95% confidence interval for the referred causes, using as a reference the value corresponding to the 1997-2000 quadrennium. To calculate the confidence interval, we used the "statacl" of the program Epi Info, Version 3.4.1. Considering the Family Health Strategy as an intervention, ratios below 1, including the confidence interval, expressed a statistically significant reduction in disease occurrence rates in the second period.

The research project was submitted to the Committee of Ethics in Research involving Human Subjects, of the Universidade Estadual de Londrina, and it was examined and approved under the recommendation 201/06, on August 7th, 2006.

Results

The DCS was the first cause of death in the city of Londrina in both quadrennia of the study, and they accounted for 3262 deaths in the first period, and for 3389 deaths in the second period. Among the DCS, the CbVD were the most prevalent (40.31% of the DSC in the first period and 37% in the second), followed by IHD (25.1% and 26.82% respectively). Altogether, in both periods, CbVD and IHD accounted for approximately 65% of the DCS deaths. Despite the reduction in DCS mortality rate in the second period, from 188.9 to 179.3/100,000 inhabitants, this reduction was not significant (ratio = 0.95, 95%CI: 0.90-1.00).

As for hospital admissions for DCS, the rate of hospitalization remained unchanged in both periods (ratio = 1.00, 95% CI: 0.97-1.02). The CbVD were responsible for 9.6% and 10.7% of total admissions for DCS in the first and second periods, respectively, but the DCS percentage increased significantly in the second period, from 19.7% to 27.1%.

Table 2 shows that, for the IHD, there was no significant change in mortality rate between the periods (ratio = 1.01, 95%CI: 0.92-1.12). Slight and not significant changes were observed in gender specific mortality rates. Among men, there was a little increase, especially in the younger group (30 to 45 years). And among women, there was a reduction in all age groups.

As to the hospitalization rates, there was a significant increase in the male/female ratio, which rose from 1.2 to 1.6, in the second period. Table 2 shows that, for the IHD, there was no significant change in mortality rate between the periods (ratio = 1.40, 95% CI: 1.31-1.44). This increase was homogeneous in both genders and in all groups. However, it was in the 45-59 and the 60+ age groups that the increase was statistically significant.

Also for the IHD, mortality and hospitalization rates were
higher in males. As to the mortality rates, the male/female ratio rose from 1.5 in the first period to 1.7 in the second. As to the hospitalization rates, the male/female ratio was reduced from 1.5 in the first period to 1.4 in the second.

Discussion

In reference to the design of ecological studies, according to Almeida Filho and Rouquayrol14, only recently the logical and methodological bases of this type of study have begun to be reviewed, and for the first time the subject has earned the attention of a chapter in the current most important Epidemiology textbook. In the context of epidemiology, ecological studies have gone through a period of intense devaluation, being relegated to the status of a purely descriptive approach, with little analytical power.

According to Morgenstern15, the ecological effects are particularly relevant when the objective of the research is to evaluate interventions in the population such as a new program, policy or legislation. However, some of the limitations mentioned by several authors16-18 should be considered in the analysis of the results of this study. The first concerns the quality of information and the second concerns the difficulty in the control of confounding factors.

As to the information used, the data collected from the municipality of Londrina, with a low proportion of ill-defined causes observed after the implementation, in the mid-1990s, of the Center for Information on Mortality (NIM), which checks all death certificates and seeks to confirm the true causes of death19, suggest good quality data. It is noteworthy that ill-defined causes account for less than 1.7% of deaths in the periods covered by the study19.

The significant differences found in rate values cannot be analyzed as resulting exclusively from the intervention (Family Health Program), since the study did not involve the controlling of confounding factors. Therefore, we could only suggest hypotheses about the possible influence of the implemented strategy on the levels of morbidity and mortality from cardiovascular diseases, which should be better explored with the use of other designs, such as case-control studies.

As to the results, this study identified a reduction by 5.1% in the DCS mortality rate in the period of 2002 to 2005, when compared to the period of 1997 to 2000. The group of causes responsible for this reduction was the CbVD, which accounted for a 12.9% reduction in the rates. These results follow the trend of decline in the prevalence of DCS and CbVD that occurred in the Southern region of the country20 and in some other countries like Japan, Australia, the United States and Western European countries, since the 1950s21. The CbVD mortality rates observed in the municipality, in
the second period, were lower than those observed in the Southern region of the country in 2001, in both genders and in all age groups.

Several studies have demonstrated that the CbVD show a significant increase in mortality with age, reaching very high values in individuals aged above 60 years, and this has also been confirmed by this study in the city of Londrina. A significant reduction in CbVD mortality rates leads us to infer that the care provided by the Family Health Program in the municipality, which has hypertension as a priority area of the program for the action of health care teams (through the distribution of medications, blood pressure control, and clinical and laboratory monitoring of patients), has contributed to the reduction in mortality rates among women and the elderly. It is noteworthy that the hypertension control measures conducted by the Family Health teams involve these two main groups: women and the elderly, as described by Sousa et al. in the implementation of this strategy in a small city of the interior of Paraná.

In the study conducted by Abreu et al., a reduction in mortality from CbVD was observed in Brazil, from 1993 to 2002. The authors attributed this reduction, in part, to changes in health services supply and access that occurred in the country in that period. According to a study conducted by Collins et al., the CbVD can be avoided in up to 42% of the cases through an adequate hypertension control. However, it should also be taken into account that the ease of access to hospitalization may have contributed to the reduction in mortality from this cause.

As to the IHD, the behavior of the disease in the city, which showed similarities in rate values in both study periods, differs from the decrease trend observed in the U.S., Western Europe, Japan and Latin America since the late 60s, and in the South and Southeast regions of Brazil, since the 1980s. According to Lotufo, mortality from IHD in Brazil is not uniform.

Regarding hospitalization in Londrina, the increase in rates may be consequent to the expansion in access to hospital care, reflecting the regulation of pre-hospital and hospital care, and the implementation of the SAMU and the city central agency of hospital beds management, in the early 2000s. Another issue to be considered in the increase mentioned refers to the technological advances in diagnostic and interventional treatment for this disease (coronary artery bypass and angioplasty) which occurred in recent years. According to Oliveira et al., in a study conducted in the state of Rio de Janeiro, there was a significant increase in admissions for IHD, with a concomitant increase in high-complexity procedures in admissions.

Despite the increase in hospitalization, there was no reduction in mortality from IHD. In this regard it should be emphasized that there is no consensus on what type of medical intervention has greater impact on the occurrence of the disease. In the study “INTERHEART,” conducted in 52 countries, assessing the effect of risk factors for myocardial infarction, it was observed that dyslipidemia, smoking habit, hypertension, diabetes, abdominal obesity, low intake of fruits and vegetables, the use of alcohol and lack of regular physical activity are the most important risk factors in all countries, in both genders and all ages. These nine factors accounted for 90% of the attributable risk in men and 94% in women.

This finding reinforces the multifactorial nature of cardiovascular diseases and the inadequacy of the interventionist actions and of those that primarily focus on the control of hypertension in the elderly. It should be taken into account that, in the etiology of the IHD, an adequate control of hypertension may decrease the occurrence of IHD in 14% of cases. These aspects indicate the need for refocusing health care procedures and expanding health care coverage, with preventive and health promotion approaches that address changes in lifestyle.

We must now ponder what preventive and health care strategies should be adopted by the Family Health teams, aiming at reducing deaths from IHD and CbVD in other age groups and particularly in the male population. In this aspect, it is essential that the various initiatives to reduce the impact of noncommunicable diseases in the Brazilian population, as those that have been proposed by the Ministry of Health - ranging from the screening of diabetes at national level, the implementation of campaigns on hypertension, the implementation of protocols for aggressive management of dyslipidemia in coronary disease patients - also have suitable conditions for implementation by local teams.

It should be stressed that only recently have strategies to promote health been adopted. The National Policy of Health Promotion, published in 2002 by the Ministry of Health, made several notes, but this was not sufficient to start concrete actions in this area. A recent strategy, released in early 2008, by ministerial decree, was the establishment of Family Health Support Centers, which operate on a multidisciplinary level, aiming to support the family health teams; if successful, it will be an important step in developing physical activity actions and promoting healthy eating habits and mental health habits, among others, which are clearly needful in dealing with these noncommunicable diseases.

Although the present analysis was based on secondary and aggregate data, the results showed a reduction in mortality rates from diseases of the circulatory system in the municipality, after the implementation of the Family Health Strategy, as a result of a reduction in mortality from cerebrovascular diseases, especially in the elderly. This reflects, to some extent, the impact of the investment in hypertension control in the prevention of cerebrovascular events. However, the maintenance of mortality levels and the increase in hospitalizations, both for CbVD and IHD among non-elderly adults, suggest the need for a deeper analysis at local level, so as to verify the extent to which the measures have reached different population groups, especially those in the labor market. Also worthy of concern is the higher morbidity and mortality observed in male patients, especially considering that further progress in promoting cardiovascular health depends largely on the capacity to include individuals which are traditionally left out of the health care system, with emphasis on basic health care. The epidemiological indicators should not be calculated only in response to government demands for transfer of resources, but they must be embedded in...
the concept of surveillance and systematic monitoring, in order to support decision making at all levels of the health care system.

Potential Conflict of Interest
No potential conflict of interest relevant to this article was reported.

References

19. Potential Conflict of Interest
This article is part of a specialization monograph in Collective Health submitted Mara Cristina Nishikawa Yagi, from Universidade Estadual de Londrina.

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