Original Articles

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Hospitalizations due to primary care-sensitive cardiovascular conditions in municipalities of Central-West Brazil

ABSTRACT

OBJECTIVE: To analyze rates of hospitalization due to primary care-sensitive cardiovascular conditions.

METHODS: This ecological study on 237 municipalities in the state of Goiás, Central-West Brazil, between 2000 and 2008, used data from the Hospital Information System and the Primary Care Information System. The hospitalization rates were calculated as the ratio between the number of hospitalizations due to cardiovascular conditions and the population over the age of 40 years. The data were evaluated over the three-year periods A (2000-2002), B (2003-2005) and C (2006-2008), according to sex, age group, population size, whether the individual belonged to the metropolitan region, healthcare macroregion, distance from the state capital, living conditions index and coverage within the Family Health Strategy. The potential population coverage of the Family Health Strategy was calculated in accordance with Ministry of Health guidelines. The variability of the rates was evaluated using the t test and ANOVA.

RESULTS: A total of 253,254 hospitalizations (17.2%) occurred due to primary care-sensitive cardiovascular conditions. The hospitalization rates diminished between the three-year periods: A (213.5, SD = 104.6), B (199.7, SD = 96.3) and C (150.2, SD = 76.1), with differences from A to C and from B to C (p < 0.001). Municipal population size did not influence the behavior of the rates. Municipalities near the state capital and those in the metropolitan area presented higher rates (p < 0.001). At all percentiles of the Life and Health Conditions Index, there were decreases in the rates (p < 0.001), except at percentile 1. Decreases were also observed in all the macroregions except for the northeastern region of the state. The reduction in rates was independent of the Family Health Strategy coverage.

CONCLUSION: The rates of hospitalization due to primary care-sensitive cardiovascular conditions decreased in these municipalities, independent of the Family Health Strategy coverage.

DESCRIPTORS: Cardiovascular Diseases, prevention & control. Hospitalization. Primary Health Care. Health Services Evaluation. Ecological Studies.

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INTRODUCTION

Cardiovascular diseases are highly prevalent and present associated complications such as stroke, heart failure and acute myocardial infarction. These diseases

have a considerable impact on the morbidity and mortality of populations[a] and have been the main causes of deaths in Brazil for some decades. In Goiás (Central-West Brazil), these diseases and their risk factors were responsible for 30.5% of the deaths and 13.9% of the hospitalizations within the public network in 2005.[b]

Primary healthcare has the following characteristics: first-contact care, longitudinality, comprehensiveness, coordinated care, centralization of the family, community approaches and cultural aptitude. It is also responsible for attending to the commonest problems within the community and has a fundamental role in cardiovascular disease control actions. Its actions go from health promotion and risk prevention to screening, specific management and prevention of disease complications.[22]

Interventions relating to chronic diseases at primary care level are very effective, especially for diabetes, high blood pressure, asthma, heart failure and depression. Primary care is associated with improvement in process indicators (evidence-based decision-making regarding drug prescriptions, requests for complementary examinations and other evaluations) or in intermediate results (improvements in blood pressure, lipid and blood glucose control, fewer consultations with focal specialists and fewer visits to emergency services). Furthermore, there is greater satisfaction among patients and a tendency for healthcare costs to decrease.[12,24] The strategies for managing chronic diseases used by clinics that base their actions on the main attributes of primary care are an organized healthcare system, linkage with the community, support and encouragement for self-care and integration of information.[22]

Identifying indicators for assessing primary care service is a complex task, given the multiplicity of actions at this care level. Indicators of hospital activity, especially hospitalizations due to primary care-sensitive conditions (PCSC), have been proposed for assessing the effectiveness of primary care. Such an indicator was created for assessing access to outpatient healthcare services in the United States at the end of the 1980s,[25] and it has come to be used for comparing the effectiveness of primary care models.[3-5]

PCSC are health conditions that can be dealt with through care provided at the first level of care within the healthcare system. The rate of hospitalizations due to PCSC measures the effectiveness of the healthcare service indirectly: users who have access to primary care services and resolve their problems at this level do not present worsening of their problems and do not need hospitalization. Therefore, better problem-resolving capability at primary care level should reduce the rate of hospitalization due to PCSC.[4,6,25] Continuity of care, a multidisciplinary team and, with lesser importance, the population registered with the physician, are associated with lower likelihood of hospitalization due to PCSC.[16,18] High rates of hospitalization due to PCSC reflect deficiencies in service coverage and/or performance within primary healthcare.[6,9,17]

Hospitalizations due to PCSC accounted for 28.5% of all hospitalizations within the Brazilian National Health System (Sistema Único de Saúde; SUS) in 2006, with a rate of 149.6/10,000 inhabitants. The conditions most frequently involved were: gastroenteritis and its complications, heart failure, asthma, lower airway diseases, bacterial pneumonia, cerebrovascular diseases and hypertension.[1] A recent study showed that there was an association between expansion of the Family Health Strategy (FHS) and reduction in the numbers of hospitalizations due to diabetes mellitus and respiratory problems. Expansion of the Community Health Agent Program was correlated with reduction in the number of hospitalizations due to cardiovascular problems among women.[13]

The aim of the present study was to analyze the rates of hospitalization due to primary care-sensitive cardiovascular conditions (PCSCC).

METHODS

This was a retrospective ecological study conducted in 246 municipalities in the state of Goiás between 2000 and 2008. Out of these municipalities, data were obtained from 237, after excluding those that did not present continuity of information. This sample loss corresponded to very small-sized municipalities (< 10,000 inhabitants). The first primary care FHS teams were set up in this state in 1998. In 2010, there were 1,071 teams, with potential coverage of the population of 57.02%.[c]

The rates of hospitalization due to PCSCC were calculated using the following formula: (number of hospitalizations due to PCSCC at a given place and time/population at the same place and time) x 10,000. The data were obtained from the Hospital Information System (HIS). The Brazilian List of Hospitalizations due to Primary Care-Sensitive Conditions,[d] which conforms to

the International Statistical Classification of Diseases and Health-Related Problems, Tenth Revision (ICD-10), was used to select causes through the following descriptors: high blood pressure (I10 and I11), angina (I20), heart failure (I50 and J81) and cerebrovascular diseases (I63 to I67; I69; G45 and G46).

For this study, hospitalizations due to PCSCC among the population over the age of 40 years were selected. The rates were calculated according to year, sex and age group (40 to 59 years; 60 years and over).

Data from the Primary Care Information System (PCIS) were gathered in order to calculate the potential population coverage of the primary care FHS team and the following formula was used: (number of FHS teams in the PCIS at a given place and time x 3,450/ total population at the same place and time) x 100, in accordance with guidelines from the Ministry of Health. The municipalities were categorized as: low coverage (< 25%), medium coverage (25% to 70%: municipalities ≤ 100,000 inhabitants; 25% to 50%: > 100,000 inhabitants) and high coverage (> 70%: ≤ 100,000 inhabitants; > 50%: > 100,000 inhabitants).[e]

The municipalities were also classified according to sociodemographic characteristics: distance from the state capital; population size (up to 50,000 inhabitants; 50,001 to 100,000; and 100,001 and over); belonging to the metropolitan region; and healthcare macroregion (Center-West, Northeast, Centre-North, Southeast and Southwest).[f,g] The Health and Living Conditions Index (HLCI), which presents greater specificity for application in relation to health, was used in a complementary manner.[14]

The potential population coverage of the FHS and the rates of hospitalization due to PCSCC were calculated for the following periods: A (2000 to 2002); B (2003 to 2005); and C (2006 to 2008). The other variables were fixed for 2000. These rates were analyzed after exclusion of municipalities with extreme data (outliers), in order to avoid possible confounding factors, and the analysis was done as three-year averages in order to smooth out instabilities in these rates in the small municipalities.[21] The rates were compared within the three-year periods (A, B or C) and over the three periods, using the t test or ANOVA, with the Scheffe test subsequently. Period B was established as the standard in the analysis according to the population coverage of the FHS. The mean percentage changes between the periods A and C were calculated with subsequent comparison between the categories by means of ANOVA, followed by the Scheffe test to analyze the

trend of the hospitalization rates. The SPSS2 software, version 18, was used for the statistical tests.

The study was approved by the Research Ethics Committee of the Federal University of Goiás (Protocol no. 040/2009).

RESULTS

There were 1,470,015 hospitalizations through SUS in the 237 municipalities between 2000 and 2008, and 253,254 (17.2%) were due to PCSCC. The percentage of hospitalizations due to PCSCC decreased in relation to the total number of hospitalizations (from 20.8% to 13.6%), from 2000 to 2008, and the gradient of the reduction was maintained over the years (Figure 1).

A sample of 221 municipalities (89.8% of the total) was obtained after excluding the municipalities with rates showing extreme values. The rates of hospitalization due to PCSCC decreased from period A (213.5; SD = 104.6) to period B (199.7; SD = 96.3) and to period C (150.2; SD = 76.1) (p < 0.001). There were statistically significant differences between the periods A and C and between B and C (p < 0.001), but not between A and B (Figure 2).

The rates diminished according to sex and age group (Figure 3). For males, the rates were: 196.9 (SD = 98.10) (A); 185.11 (SD = 84.14) (B); and 137.40 (SD = 68.24) (C) (p < 0.001). The male rates according to age group were, for 40 to 59 years: 92.67 (SD = 56.09), 84.71 (51.90) and 60.42 (35.94) (p < 0.001); and for 60 years and over: 427.21 (217.43), 410.24 (93.51) and 297.27 (85.27) (p < 0.001). For females, the rates for the periods A, B and C were, respectively: 231.79 (25.31), 215.69 (121.48) and 164.16 (94.37) (p < 0.001); 125 (82.56), 109.53 (71.72) and 79.85 (54.62) (p < 0.001) from 40 to 59 years; and 474.40 (252.29), 460.65 (270.89) and 341.89 (206.42) (p < 0.001) for 60 years and over. In all these situations, there were statistically significant differences between the periods A and C and between B and C (p < 0.001).

There were no significant differences in the rates for each period according to population size (Table), but there were differences in the means for hospitalization between the periods A and C and between B and C (p < 0.001) in the municipalities with up to 50,000 inhabitants, in the longitudinal analysis.

The rates were greater in the municipalities in the metropolitan region. Analyzed separately, the municipalities that did not belong to the metropolitan region presented significant decreases in their rates between

[e] Mendes EV. A atenção primária à saúde no SUS. Fortaleza: Escola de Saúde Pública do Ceará; 2002.

[f] Programa das Nações Unidas para o Desenvolvimento (PNUD). Atlas do desenvolvimento humano no Brasil [cited 2009, Jan]. Available from: http://www.pnud.org.br/atlas/

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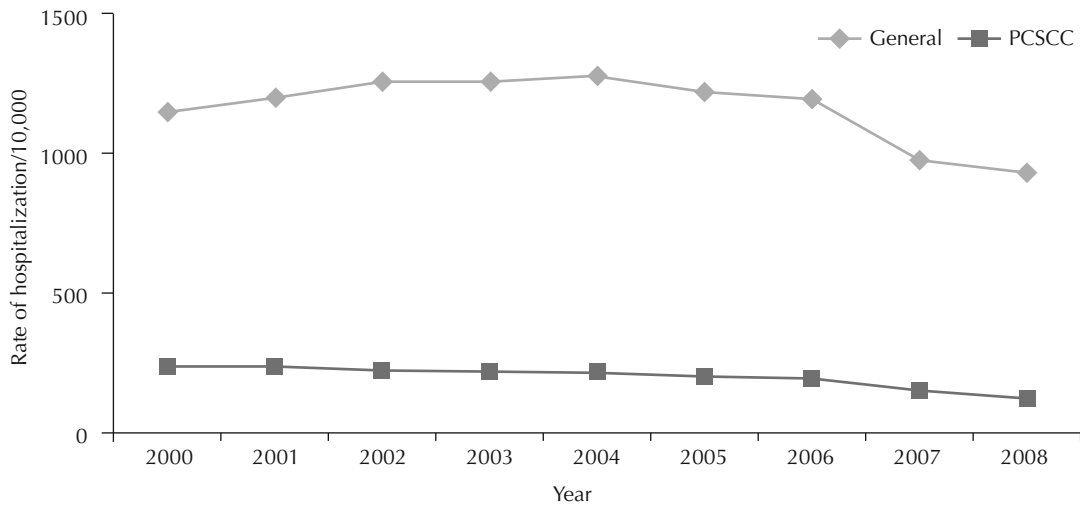
Figure 1. Mean rates of hospitalization within the Brazilian National Health System due to general conditions and due to primary care-sensitive cardiovascular conditions, per 10,000 inhabitants, among individuals aged 40 years and over. Goiás, Central-West Brazil, 2000 to 2008.

the periods A and C and between B and C (p < 0.001). This was not observed among the municipalities of the metropolitan region.

Differences between the rates were observed in each period according to the health macroregion. The mean rates decreased in all the macroregions in the temporal analysis, except in the northeast, where an increase was observed (26.4%). This region differed from the others with regard to comparing the mean differences in rates in the municipalities over the period, according to healthcare macroregion (p < 0.001).

Higher rates were observed in municipalities closer to the state capital. The behavior of rates within the same category showed differences in all the percentiles, with significant differences between the periods A and C and between B and C. In comparing the percentage mean

difference between the categories, there was only a difference between the municipalities of percentiles 1 and 2 (p = 0.04).

The lowest mean rate of hospitalization due to PCSCC was observed in the group of municipalities with the lower HLCI, i.e. with the worst health and living conditions (percentile 1) during all periods. There were decreases in the rates studied in all percentiles (p < 0.001), except for percentile 1. In comparing the mean percentage change in rates, a difference was observed between these municipalities and the others (p = 0.02).

Rate reductions were observed independent of the FHS coverage (p = 0.002; p = 0.003; and p < 0.001). These differences occurred between the periods A and C and between B and C (p < 0.04), except for municipalities
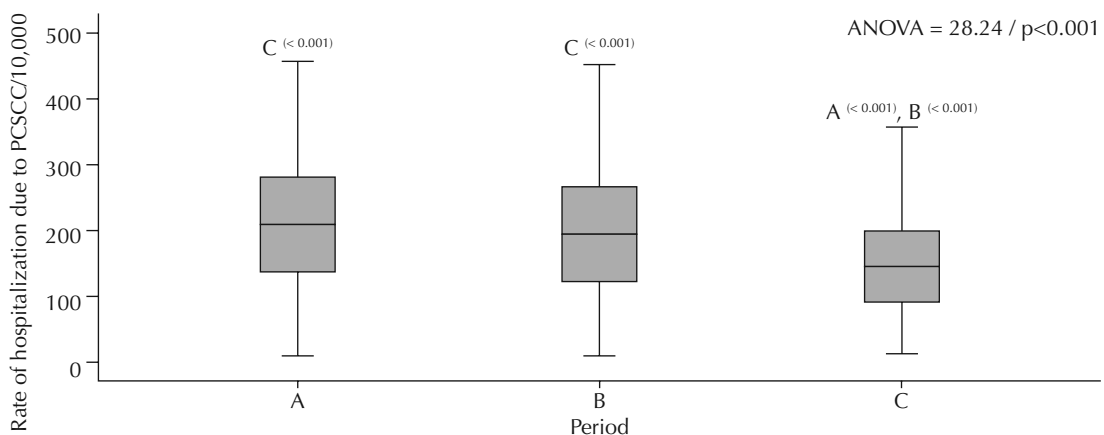

Figure 2. Mean rates of hospitalization within the Brazilian National Health System due to primary care-sensitive cardiovascular conditions, per 10,000 inhabitants, among individuals aged 40 years and over. Goiás, Central-West Brazil, 2000 to 2008.
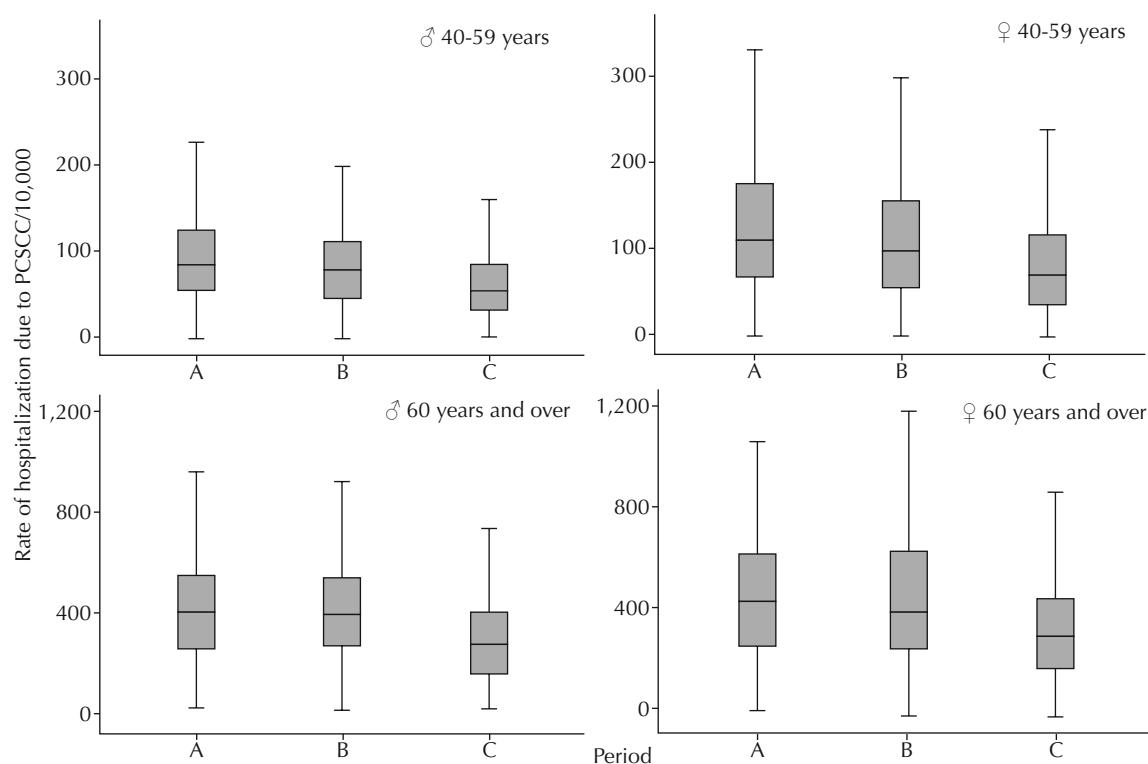
Figure 3. Mean rates of hospitalization within the Brazilian National Health System due to general conditions and due to primary care-sensitive cardiovascular conditions, per 10,000 inhabitants, among individuals aged 40 years and over, according to sex and age group. Goiás, Central-West Brazil, 2000 to 2008.

with low coverage, for which there was only a difference between A and C. There was no difference in the mean percentage reduction in rates according to population coverage by the FHS (p = 0.31).

DISCUSSION

The general hospitalization rate and the rate due to PCSCC decreased for both sexes and all age groups considered, in Goiás from 2000 to 2008. These results were close to those of other Brazilian studies that have indicated reductions in the rate of general hospitalization and the rate due to PCSCC in this country. Alfradique et al (2009)[1] showed that there was a reduction of 15.8% in hospitalizations due to PCSCC and of 10.1% due to other conditions, in Brazil from 2000 to 2006. A study conducted in 2,448 Brazilian municipalities (86% of the population) showed that there was a reduction in the rates of hospitalization due to PCSC from 1998 to 2002,[13] and this was confirmed in a more recent study (Macinko et al, 2010).[15] Increased access to healthcare services and improvement in health conditions among the population may explain this reduction.[1,2,15]

The hospitalization rates among females were higher than among males. Women use healthcare services more than men do, especially for preventive care.[20] A study

conducted in Porto Alegre in 2003 showed that the adjusted prevalence rate was 1.55 (95%CI 1.34;1.79) for women, in relation to men, regarding healthcare service use.[8] Women seek healthcare services more often and, for this reason, are subjected to a greater number of procedures, including preventive hospitalization.[19] According to Guanais & Macinko,[13] the FHS was effective for reducing the rates of hospitalization due to cardiovascular conditions only among the female population. Along the same lines, Macinko et al[15] showed that there was a reduction in hospitalizations due to PCSCC in which hypertension was the cause of hospital admission, only for females. With regard to stroke and other cardiovascular diseases, there were reductions for both sexes, but the reduction among women was more evident.

The analysis according to the potential population covered of the FHS showed that there was a statistically significant reduction in the rates of hospitalization due to PCSCC over the periods in all the groups of municipalities. Lower rates of hospitalization due to PCSC have been correlated with the quality of primary healthcare services in a large proportion of the studies. Nedel et al[17] observed a rate hospitalization due to PCSC of 42.8% among people living in a FHS area, versus 61.3% among those in a non-FHS area (PR = 0.70; 95%CI 0.57;0.86), in the municipality of Bagé

Table. Mean rates of hospitalization within the Brazilian National Health System due to primary care-sensitive cardiovascular conditions, per 10,000 inhabitants, among individuals aged 40 years and over, according to population size, metropolitan region, health macroregion and distance from the state capital. Goiás, Central-West Brazil, 2000 to 2008.

Variable	Period			Difference (%)	F	p[a]
	A	B	C			
Population size				p = ns		
Up to 50,000	214.67	199.68	150.75	-19.05	26.65	< 0.001
From 50,001 to 100,000	194.03	201.90	146.35	-7.67	0.58	0.56
100,001 and over	204.54	196.22	136.33	-8.69	1.53	0.25
Metropolitan region				p = ns		
Yes	236.98	287.58	195.02	-17.28	2.30	0.122
No	212.46	195.95	148.26	-18.29	27.50	< 0.001
Macroregion				p < 0.001		
Center-north	235.09	193.91	148.46	-28.04	15.63	< 0.001
Center-west	238.33	233.49	168.54	-23.85	16.78	< 0.001
Northeast	142.64	168.09	155.87	26.41	0.56	0.57
Southeast	177.09	153.48	112.43	-24.58	4.92	0.01
Southwest	164.23	177.65	123.75	-21.35	3.26	0.04
Distance from state capital (km)				p = 0.04		
0 to 103.09	254.98	238.19	161.74	-34.06	14.57	< 0.001
103.1 to 173.57	197.81	189.71	143.38	-4.85	5.33	0.006
173.58 to 271.50	209.47	183.43	145.69	-21.38	7.07	0.001
271.51 to 485.46	194.62	189.36	150.63	-12.21	4.29	0.015
HLCI				p = 0.02		
0.296 to 0.472	152.19	150.37	127.14	4.88	1.54	0.216
0.473 to 0.522	222.69	210.26	154.44	-22.95	8.31	< 0.001
0.523 to 0.563	247.47	220.84	156.29	-31.80	16.99	< 0.001
0.564 to 0.779	232.42	218.02	163.05	-21.77	8.19	< 0.001
Potential coverage of FHS				p = 0.31		
Low	226.62	191.16	138.32	-29.83	7.50	0.002
Medium	210.46	213.61	146.45	-21.20	6.17	0.003
High	214.63	196.37	151.17	-17.94	17.39	< 0.001

[a] In relation to the same category within each variable, analyzed for the periods A, B and C.
HLCI: Health and Living Condition Index
FHS: Family Health Strategy

(Southern Brazil). A study conducted in Montes Claros (Southeastern), showed that the likelihood of hospitalization due to PCSC was doubled when the regular healthcare checks were made outside of the FHS.[9] In an investigation on specific conditions (stroke and acute myocardial infarction), a study conducted in the south of Santa Catarina (Southern) showed that municipalities with adequate FHS had lower rates.[7]

A large proportion of requests for hospitalization, even among patients followed up within the FHS, are made by duty physicians in emergency services. It is believed that these professionals' actions are based on hospital practices, while physicians within primary care consider the patient's complete context. A discussion on

the mechanisms for referral and counter-referral and their influence on hospitalization rates is necessary, along with discussion on the mechanisms of the role of family and community physicians within the Brazilian healthcare system.[10]

The quality of the healthcare services within the FHS needs to be questioned. Because of methodological limitations, no analysis on the quality dimensions of these services was performed in this study (lack of trustworthy data sources for this classification). Only the potential coverage by the FHS might not have an impact on the health conditions of the population.[2,3,7,18] Assessments on other variables could, with appropriate methodology, provide a new scenario for

this analysis.[2,18] Examples of this include the number of medical and nursing consultations per inhabitant per year, the frequency and quality of home visits, the secondary and/or tertiary support network for these teams, and a continuing education process that is appropriate for these teams' real situations.

In the analysis on the rates of hospitalization due to PCSCC according to socioeconomic indicators, we noted that a group of municipalities with a tendency towards higher rates appeared: those with larger populations, belonging to the metropolitan region, close to the state capital and with better health and living condition indexes. Thus, the phenomenon put forward in the "inverse care law" was observed, i.e. the health conditions of the population and its differentials are strongly dependent on the way in which the social distribution of wealth is organized. In other words, there is greater provision of services, including healthcare, when the population is less needy.[6] Proximity to the hospital, 24-hour functioning of clinics and excess numbers of consultations (which are characteristics of large urban centers) are associated with higher hospitalization rates.[18]

The northeastern macroregion of the state, which has worse socioeconomic conditions, presented an increase in rates, thus diverging from the other macroregions of the state, where decreases were observed. Hospitalizations due to PCSC are related to and sometimes conditioned by factors that primary care has not controlled. The differences between the populations may explain the different morbidity patterns, and they may be caused by cultural differences in service use, rather than just by the problem-resolving capability of primary care.[11]

Ecological fallacy is a limitation to be taken into consideration,[2,7] i.e. the impossibility of individualizing the risk of hospitalization. Causal inferences in relation to individuals, proposed based on group observations, need to be used with certain restrictions.

This study was conducted using secondary data that had been reported to the Ministry of Health. Thus, in the present study, it was impossible to determine whether hospitalization was necessary from a clinical point of view, since there was no certainty that there really was a clinical indication for these hospitalizations. Nevertheless, a study on the quality of information contained in a database constituted by data from Hospital Admission Authorization forms showed that the kappa indices for concordance between the forms and the clinical indication were 0.793 and 0.725 for congestive heart failure and high blood pressure, which suggests that these data can be trusted.[23]

The hospitalizations studied here represent those made through SUS and do not reflect the reality in Goiás because they do not include the population that does not use SUS. Moreover, rehospitalization of the same individual cannot be categorized in the SUS Hospital Information System, although this is an important variable in assessing the impact of healthcare services on these conditions.

The present study aimed to contribute towards the different spheres of the SUS management process relating to provision of FHS services, by showing that coverage by the FHS does not in itself ensure quality in the healthcare provided for the population. Expansion of its coverage together with improvement of its quality standards might produce an effective intervention. The results presented here may assist in proposing and evaluating actions aimed at continually improving these services, with the objective of achieving the highest quality levels and thus having an impact on health conditions among the population.

Further studies are needed in order to establish the impact of primary care services within the FHS on the rates of hospitalization due to PCSCC, including detailed analyses through assessing quality components, including: the work process of the teams (access, accessibility and coverage of the actions that are made available, among others), the role of primary care within the FHS in relation to the healthcare system and the continuing education process among the professionals in these teams, with regard to appropriate and timely management of patients with cardiovascular conditions and associated risk factors.

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