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HOSPITAL MORBIDITY AMONG ELDERLY PATIENTS, BEFORE AND AFTER INFLUENZA VACCINATION IN THE STATE OF PARANÁ

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This ecological study was developed to evaluate the patterns in hospital morbidity due respiratory diseases among people over 60 years old residing in the State of Paraná, before and after the implementation of vaccination campaigns against influenza. The data about hospitalizations in the 1995-2005 period were obtained from the Hospital Information System and grouped according to health center macro-regions, month of occurrence, gender and age group. The data was submitted to Analysis of Variance and Tukey statistical tests, and showed a decreasing tendency in hospitalizations in both genders after the vaccinations started, with different levels among age groups, gender, months of the year and health center macro-regions. The risk for hospitalization was higher for males and for older patients, from June to October, and in macro-region number 3, followed by regions 4, 5, 6, 2 and 1.

DESCRIPTORS: influenza vaccines; mass immunization; influenza, human; respiratory tract diseases; morbidity; aged; health of the elderly

MORBILIDAD HOSPITALARIA, EN ANCIANOS, ANTES Y DESPUÉS DE LA VACUNACIÓN CONTRA LA INFLUENZA EN EL ESTADO DE PARANÁ

Se trata de un estudio ecológico desarrollado con el objetivo de evaluar el comportamiento de la morbilidad hospitalaria relacionada a enfermedades respiratorias en mayores de 60 años, residentes en el Estado de Paraná, antes y después del inicio de las campañas de vacunación contra la influenza. Los datos referentes a las internaciones, ocurridas en el período de 1995 a 2005, fueron obtenidos del Sistema de Informaciones Hospitalarias y agrupados por macro regiones de salud, meses de ocurrencia, sexo e intervalos de edad. Los datos fueron sometidos a las pruebas estadísticas Análisis de Varianza y Tukey y demostraron una tendencia a disminuir las internaciones después del inicio de la vacunación en ambos sexos, con estándares diferentes entre los intervalos de edad, sexo, meses del año y macro regiones de salud. El riesgo de internación fue mayor en los hombres más ancianos, durante los meses de junio a octubre y en la macro región 3, seguida por la 4, 5, 6, 2 y 1.

DESCRIPTORES: vacunas contra la influenza; inmunización masiva; gripe humana; enfermedades respiratorias; morbilidad; anciano; salud del anciano

MORBIDADE HOSPITALAR EM IDOSOS ANTES E APÓS VACINAÇÃO CONTRA INFLUENZA NO ESTADO DO PARANÁ

Trata-se de estudo ecológico, desenvolvido com o objetivo de avaliar o comportamento da morbidade hospitalar por doenças respiratórias em maiores de 60 anos, residentes no Estado do Paraná, antes e após o início das campanhas de vacinação contra influenza. Os dados referentes às internações ocorridas no período de 1995 a 2005 foram obtidos do Sistema de Informações Hospitalares e agrupados por macrorregionais de saúde, meses de ocorrência, sexo e grupo etário. Os dados foram submetidos aos testes estatísticos Análise de Variância e Tukey e demonstraram tendência à queda das internações após início da vacinação em ambos os sexos, com padrões diferentes entre as faixas etárias, sexo, meses do ano e macrorregionais de saúde. O risco de internar foi maior entre os homens e entre os mais idosos, durante os meses de junho a outubro e na macrorregional 3, seguida pelas macrorregionais 4, 5, 6, 2 e 1.

DESCRITORES: vacinas contra gripe; imunização em massa; influenza humana; doenças respiratórias; morbidade; idoso; saúde do idoso

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INTRODUCTION

Population aging was a characteristic reality of the world during the 20th century. In Brazil, the process of aging occurs abruptly, fast and in a context of huge social inequalities, i.e. without the establishment of economic and social changes that could warrant a better quality of life for the elderly[1].

With higher numbers of seniors in the population, important changes are evident in the cause of diseases and deaths, with an increasing prevalence of sequelae and complications of chronic-degenerative conditions[2]. Among the causes of morbidity and mortality in the population over 60 years old, respiratory diseases constitute the main cause of hospitalization, in which infection by the influenza virus infection and its complications stand out in the past decades.

Among the actions for prevention health problems in the elderly, influenza vaccinations are the primary strategy, since they can prevent up to 70% of the cases of hospitalization due to pneumonia and influenza[3]. For the severe form of the disease, secondary complications and deaths, effectiveness can be as high as 60%[3].

Considering that the measures of health promotion and prevention towards the elderly which aim to reduce complications of influenza can impact the quality of life and survival of this group, the objective of his study was to evaluate the behavior of some indicators of hospital morbidity, in the elderly population of the state of Paraná, during the 1995-2005 period.

METHOD

This is a descriptive ecologic study about the elderly population living in the State of Paraná, admitted to hospitals due to respiratory diseases during the 1995-2005 period. Studies with a spatial-temporal approach allow for the characterization of the tendencies of phenomena that do not share a single epidemiological profile within the Brazilian territory, being regionally different due to several factors. Ecologic studies are appropriate to evaluate the effectiveness of interventions in a group of people belonging to a given geographic area.

The state of Paraná is divided in six healthcare macro-regions,. Macro-regions 1, 2 and 4, located in the South of the state, present a temperate climate, with harsher winters. In the other regions, the climate is humid and subtropical.

Therefore, the existence of a large database compiling information about hospitalizations for the country and its regions, states, cities, macro- and micro-areas would be an important condition for the definition of the research design, allowing for comparisons among the macro-regional healthcare divisions of the State.

The DATASUS database was used as a source for collecting population and morbidity data. More specifically, the Hospitalization Authorizations - *Autorizações de Internação Hospitalar* (AIHs), were used to identify the variables: main diagnosis, gender, age groups and places of residence for people over 60 years old, who had been hospitalized by the Single Health System (SUS), during the 1995-2005 period.

These data were the base for the calculation of the following indicators: Rate of hospitalizations due to respiratory diseases per 1000 elderly inhabitants (TIRDS/1000 inhabitants); Ratio of hospitalizations due to respiratory diseases selected among the total of hospitalizations due to respiratory diseases (PIDRS/TIDR); Ratio between monthly internments due to respiratory diseases and the monthly amount of available beds in medical clinics (RIDRS/LCM)

The selected respiratory diseases were pneumonia, influenza and chronic obstruction of the upper airways, since these diagnoses reflect the impact of influenza in the community[4]. In the International Classification of Diseases, these diagnoses refer to the items: 480-483, 485-487, 490-491 and 496 for the 9th ICD revision and J10-J19 and J22; J40-J42 and J44 for the 10th ICD revision.

After data collecting, reviewing and pre-coding, tables were built with a percentile distribution for qualitative or categorical variables, and the calculation of measurements for the quantitative or non-categorical variables. The ANOVA variance analysis statistical test was used to compare the average variation of the studied indicators, and also to verify whether this variation happened due to vaccinations or by chance. After the difference between the averages had been confirmed, Tukey's test was used for the examination of averages and the difference between them, considering a significance level of 0.05.

RESULTS

During the period studied (1995 to 2005), the respiratory tract diseases occupied a noteworthy position among the other hospitalizations of elderly patients in the state of Paraná, constituting the second cause of hospitalization, except in 1998, when they ranked first[5].

It is interesting to observe that, despite the progressive increase of survival rates and the consequent increase of the elderly population in the state, the number of admittances due to respiratory diseases was stable in all macro-regional healthcare divisions. Furthermore, the analysis of the indicators TIDRS/1000 inhabitants, PIDRS/TIDR and RIDRS/LCM through ANOVA showed that there is a significant difference when the indicators before 1999 are compared. That was the year when the influenza vaccination campaigns were started.

As for the macro-regional divisions, we observed that there are differences among them. Macro-regional divisions 1, 2 and 6, besides behaving similarly for the evaluated indicators, presented the best indicators. Macro-regional divisions 5, 4 and 3 showed mutual differences and also with the other divisions, with division 5 having better rates, followed by 4 and 3, in this order.

The TIDRS/1000 inhabitants indicator shows that the selected respiratory diseases were responsible for 24 to 25% of total hospitalizations due to respiratory diseases for the population over 60 years old in the state of Paraná, between 1995 and 1998. This percentage gradually decreased from 1999 (22.92%) onwards, reaching 18.06% in 2005.

The comparison between the averages of the TIDRS/1000 elderly inhabitants, found in the years before and after the beginning of the vaccination campaigns showed a significant difference between both groups, with the first group presenting a higher average rate of hospitalization.

The reduction of the indicator presented statistical significance for both genders and for the five-year age groups, with the risk of hospitalization due to respiratory disease being 1.09 times (8.36%) higher for males and gradually increasing with age, since, when 60 to 64 year-old patients were compared with the other age groups, the risk of hospitalization because of such diseases was 3.2 times higher for those older than 80, 2.84 times higher among those aged 75 to 79, 2.18 times higher for those aged 70 to 74 and 1.47 times higher for those aged 65 to 69.

In the healthcare macro-regional divisions, a similar behavior to that of the State as a whole was observed. This indicator was seen to be higher among women only in macro-regional division 3. This aspect is interesting and can even be the object of further studies, since this is the only macro-regional division with a higher male population (50.3% males) over 60 years old. The macro-regional division presenting the lowest hospitalization rate for the selected respiratory diseases was 1, followed by 6 and 2, with similar rates, and then by 5, 4 and 3, in this order.

The PIDRS/TIDR indicator showed that the ratio of hospitalizations in the State of Paraná due to the selected respiratory diseases is significantly lower after the vaccination interventions when compared to the total amount of respiratory disease hospitalization, decreasing from 23.70% in 1995 to 18.06% in 2005. During the two studied periods, PIDRS/TDR was 1.03 times higher among male seniors, and the selected respiratory diseases behaved seasonally, with the months of June, July, August and September showing the highest rates for the indicator.

As for the spatial distribution, macro-regional division 1 was observed to present the lowest index for this indicator, followed by 6. Divisions 5 and 2 hold the third place, and lastly, divisions 4 and 3.

The RIDRS/LCM indicator showed that the ratio between monthly hospitalizations due to selected respiratory diseases and the number of available beds in medical clinics for the State of Paraná increased progressively between 1995 (0.26) and 1992 (0.31), with a significant downward tendency between 1999 (0.34) and 2005 (0.29). This drop, observed since the vaccination interventions, happened for both genders and the three age ranges evaluated, with the average RIDRS/LCM indicator lower for those over 80 years old, followed by those aged 70-79 and with a higher rate of hospitalization for patients aged 60-69.

Seasonality was also perceived for this indicator, with the months of June to November presenting higher RIDRS/LCM.

Among the macro-regional healthcare divisions of Paraná, the evolution of the RIDRS/LCM according to age ranges and gender showed that the indicator increased proportionally to age in the first years. However, it was altered in all macro-regions throughout the period, with a higher prevalence of hospitalizations for seniors aged 70-74, followed by those aged 60-69, and finally, those over 80 years old. When genders were compared, the occurrence of this phenomenon was observed to start primarily among male seniors.

Table 1 – Comparison of the average values for the indicators: TIDRS/ 1000 elderly inhabitants, PIDRS/ TDR and RIDRS/LCM according to vaccination, gender, age range, healthcare macro-regional division and months of the year. State of Paraná, 1995-2005

	TIDRS/1000 inhab.	PIDRS/TDR	RIDRS/LCM
Vaccination State			
Before 1999	62.444 b	27.50214 b	0.051977 b
After 1999	75.703 a	30.50516 a	0.056375 a
Gender			
Female	64.30445 b	28.15342 b	-
Male	70.22594 a	29.03487 a	-
Age Group			
60-69 years old	37.1331 c	-	0.064001 c
70-79 years old	75.2692 b	-	0.066103 b
80 years or older	111.5214 a	-	0.034222 a
Macro-regional division			
1	37.8986 e	19.57773 d	0.037794 f
2	46.6487 d	29.13747 b	0.040718 e
3	123.5716 a	36.04503 a	0.074728 a
4	87.5429 b	35.09621 a	0.066610 b
5	61.6286 c	28.08009 b	0.063592 c
6	46.3006 d	23.62835 c	0.045212 d
Month			
January	-	26.16679 hi	0.048821 d
February	-	24.78552 i	0.047416 d
March	-	25.34475 i	0.048401 d
April	-	26.28262 hi	0.048033 d
May	-	27.35835 fgh	0.051231 d
June	-	30.68478 bc	0.058148 bc
July	-	33.13092 a	0.064980 a
August	-	32.35056 ab	0.062072 ab
September	-	31.30750 abc	0.061325 ab
October	-	29.79814 cd	0.059509 bc
November	-	28.59808 def	0.056276 c
December	-	27.32175 fgh	0.051095 d

Note: Similar letters mean that the variables behaved similarly. Different letters represent significant 5%-differences.

DISCUSSION

Although it was difficult to deal with a database compiling a large amount of information, such as Datasus, and to obtain updated and complete information, the trend of morbidity due to the selected respiratory diseases for the State of Paraná reveals a significant drop of the indicators after the start of vaccination interventions against influenza.

The first result to be considered is the continued second position of respiratory tract diseases as the cause of hospitalizations among seniors in the State of Paraná throughout the study period[5]. Respiratory diseases also occupy the second place for hospitalizations among seniors in all regions of the country. However, in the South and Southeast regions, this ratio is much higher than in other regions, since they account for 29.13% and 35.42% of the total hospitalizations of seniors, respectively, with values of 4.31% for the North region, 8.21% for the Central-West and 22.92% in the Northeast. This leads us to infer that, in the states of the South and Southeast regions, respiratory diseases in elderly patients are much more important than in states of other regions.

A hospital morbidity study performed in the State of São Paulo from 1995 to 2002 showed a lower percentage of hospitalizations due to respiratory tract diseases than those found in Paraná. Whereas, in São Paulo, respiratory tract diseases were responsible for 10%-11% of the total hospitalizations of the population over 60 years old[4], this ratio was around 24% for Paraná. However, in both states, a reduction in the amount of hospitalizations due to respiratory tract diseases was observed after vaccination interventions against influenza[6]. In Porto Alegre, the impact of the vaccination campaigns against influence was analyzed from 1996 to 2000, and showed a decrease of 25.2% for pneumonia hospitalizations[7].

A study about the strategy of influenza vaccination in Brazil realized that the campaigns have exerted a positive impact in the temperate Southern and Southeastern regions of the country, but not in the others, with tropical climates, especially in the North and Northeast[8]. Studies performed in Fortaleza[9] and the Federal District, for example, showed no reduction in the hospitalization and death rates in people over 60 years old[10].

The falling tendency of the hospitalization rate due to the selected respiratory diseases per 1000 senior inhabitants (TIDRS/1000 inhabitants) between 1995 and 2005, particularly more expressive after 1999, confirms what has been touted about anti-influenza vaccines being capable of reducing the number of hospitalizations of elderly people[11]. Some studies show, for example, that the influenza vaccine reduces hospitalizations due to pneumonia, influenza and chronic respiratory diseases in 30-70% for seniors who do not live in nursing homes[12]. In Argentina, a 30-45% reduction was found in hospitalization rates due to pneumonia after receiving influenza vaccines[13].

When the evolution of hospital morbidity due to respiratory diseases is compared between the states of São Paulo and Paraná, the total amount of hospitalizations decreased in Paraná but remained stable in São Paulo[4].

The TIDRS/1000 inhabitants ratio was significantly reduced for both genders and five-year age groups in the state of Paraná from 1995 to 2005. Moreover, as seen in the state of São Paulo, this indicator was also higher among men and gradually increased according to age in the state of Paraná[4].

The hospitalization ratio due to the selected respiratory diseases among the total hospitalizations due to respiratory disease – PIDRS/TDR in Paraná is lower than the overall Brazilian ratio. Whereas this indicator increased from 23.79% to 24.15% in the state of Paraná in 1995-1998, it fell progressively after 1999, reaching 18.06% in 2005. For Brazil, PODRS/TDR has progressively increased, from 57.64% in 1995 to 61.83% in 1997. In 1998, it dropped to 35.11% and, after the vaccination interventions started, it showed a falling trend, registering 34.12% in 2002. However, it increased again in the three following years, reaching 40.56% in 2005[5].

Conversely, during the 1995-2002 period, PIDRS/TDR was lower in the state of São Paulo than in Paraná. However, this indicator behaved similarly between both states, increasing in the first years and tending to decrease after the vaccination interventions[4]. The lower ratio of hospitalizations due to pneumonia in relation to the overall number of hospitalizations due to respiratory diseases was also described for seniors living in Porto Alegre[7].

In Paraná, this ratio was higher among male seniors, and the seasonal character of the diseases that afflict this share of the population due to influenza was evident, with higher values in the period from June to October.

This seasonality, which corresponds to the colder period of the year, was also observed in several regions of Brazil, such as the states of Rio Grande do Sul[14] and São Paulo[4] and the cities of Maceió[15] and Belém[16]. In Fortaleza, however, the period with the highest number of hospitalizations comprehends March and April, this being one of the factors associated to the low effectiveness of the vaccination campaigns in these regions, because the vaccines are only made available by the Ministry of Health from April onwards[9].

The indicator ratio of monthly hospitalizations due to the selected respiratory diseases and the available beds in medical clinics (RIDRS/LCM) for the State of Paraná is lower than the one found for Brazil as a whole. While the RIDRS/LCM increased progressively in Paraná from 1995 (0.26) to 1998 (0.31) and presented a significant falling tendency between 1999 (0.34) and 2005 (0.29), the indicator remained stable for Brazil in the three first years of the study (0.15), increasing in 1998-1999 to 0.19, and remaining mostly stable since then[5].

The drop observed for RIDRS/LCM in Paraná after the vaccination interventions affected both genders and the three age groups evaluated, with the average value of this indicator being inversely proportional to age. This fact, higher average number of hospitalizations among the younger age groups, is a consequence of its own percentile representation in the elderly population of Paraná, since the number of seniors is inversely proportional to age.

Seasonality was also observed for this indicator, with the higher RIDRS/LCM months being those from June to November.

In the state of São Paulo, as well as in Paraná, after the influenza vaccinations for people over 60 were started, a change was observed in the charts and tables showing the indicator, with lower peaks during the influenza seasons[4].

If we consider the growth of the elderly population in Paraná during the studied period, from 6.82 to 8.33%, and the reduction of available beds for hospitalization, from 10,725 in 1995 to 8,654 in 2002, it can be inferred that the drop in the RIDRS/LCM was higher and more significant than the results presented here.

FINAL CONSIDERATIONS

Through these hospital morbidity indicators, we could observe differences in the behavior of hospitalizations among regions of the same state, in addition to the positive impact of the vaccination interventions to reduce hospitalization of seniors due to respiratory diseases. This fact may be related, on the one hand, to unavoidable factors like the current viral strain, climate factors, representation of the five-year groups and gender in the composition of the senior populations of each macro-regional division. However, on the other hand, it could be a consequence of the conditions and quality of healthcare and the resources available/offered.

Anyway, the differences found among the healthcare macro-regional divisions remind us of the need for studies that can also evaluate the behavior of these indicators between the different regions of Brazil, so that the similarities and differences among these regions can be identified as determiners in the benefits attained by this vaccination strategy.

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