




Epidemiological profile of hospital admissions for pneumonia in Bahia, between 2015 and 2019

Perfil epidemiológico das internações hospitalares por pneumonia na Bahia, entre 2015 e 2019

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ABSTRACT | OBJECTIVE: To describe the epidemiological profile of hospitalizations for pneumonia in the State of Bahia, from 2015 to 2019. **METHODS:** Ecological, descriptive, and retrospective study, with secondary data from the Hospital Admissions System (SIH), for cases of pneumonia by location of hospitalization, made available by the Department of Informatics of the Unified Health System (DATASUS) between 2015 and 2019. **RESULTS:** The Southwest and South macroregions have most cases, representing, respectively, 20.48% and 17.5%. As for age groups, early childhood (from 1 to 4 years old) with 24.6% of cases, and the elderly over 80 years old with 14.1%. Males correspond for 51.9% of cases. Concerning color/race, brown corresponds to 84.8% and black to 4.26%, characterizing the black population in most cases. **CONCLUSION:** The data reveal that pneumonia represents an important cause of hospital admission, especially in the first years of life or in senescence. Knowledge of the characteristics described, based on data from the Hospitalization System, constitutes a set of important information for planning and monitoring health actions aimed at the most vulnerable populations in the state of Bahia.

DESCRIPTORS: Pneumonia. Internment. Bahia. Epidemiology.

RESUMO | OBJETIVO: Descrever o perfil epidemiológico das internações hospitalares por pneumonia do Estado da Bahia, no período de 2015 a 2019. **MÉTODOS:** Estudo ecológico, descritivo e retrospectivo, com dados secundários do Sistema de Internações Hospitalares (SIH), para casos de pneumonia por local de internação, disponibilizados pelo Departamento de Informática do Sistema Único de Saúde (DATASUS), entre 2015 e 2019. **RESULTADOS:** As macrorregiões Sudoeste e Sul apresentam a maioria dos casos, representando, respectivamente, 20,48% e 17,5%. Quanto às faixas etárias, a primeira infância (de 1 a 4 anos) com 24,6% dos casos, e os idosos maiores de 80 anos com 14,1%. Os indivíduos do sexo masculino correspondem a 51,9% dos casos. Em relação à cor/raça, a parda corresponde a 84,8% e a preta por 4,26%, caracterizando a população negra com a maioria dos casos. **CONCLUSÃO:** Os dados revelam que a pneumonia representa importante causa de internamento hospitalar, destacando-se o acometimento nos primeiros anos de vida ou na senescência. O conhecimento das características descritas, a partir dos dados do Sistema de Internação Hospitalar, constitui um conjunto de informações importantes para o planejamento e monitoramento das ações em saúde voltadas as populações mais vulneráveis do estado da Bahia.

DESCRITORES: Pneumonia. Internamento. Bahia. Epidemiologia.

Introduction

Pneumonia is a disease of the low respiratory tract that affects the bronchi, bronchioles, and pulmonary alveolus, and can be caused by microorganisms such as bacteria, viruses, and fungi, as well as by inhalation of toxic products. Its main symptomatology occurs with the presentation of productive cough, possible hemoptysis, fever (higher than 37.8 °C), dyspnea, chills, and chest pain when breathing.¹⁻²

Pneumonia is diagnosed through the analysis of several findings obtained by clinical examination, auscultation of the lungs, thorax radiographs, and laboratory tests.¹ Its main pathogens are *Streptococcus pneumoniae*, *Haemophilus influenzae Type B* (Hib), and Respiratory Syncytial Virus (RSV), and its transmissibility results from aerodispersoids, contaminated saliva/secretion, blood transfusion, and sudden temperature variations (alteration of ciliary function in air filtration).²⁻⁵

Pneumonia can be divided between hospital/nosocomial, community, and immunocompromised, the first resulting from infection concomitant with hospitalization for two or more days and up to the previous three months. In the community, it results from transmission outside the hospital environment in contact with the community, while in immunocompromised the host organism does not have an immunological defense either using immunosuppressants or previous pathology that causes immunity deficit.⁶

Despite being a worldwide pathology, its recurrence has a great connection with developing countries, being the main cause of hospitalization of children under 5 years of age, by community transmission of *Haemophilus influenzae*, and in those over 65 years of age by *Streptococcus Pneumoniae*. Its incidence is linked to spring, autumn, and winter, characterizing its seasonality.⁷

Emphasizing that worldwide the annual incidence of 150.7 million new cases of pneumonia in children up to 5 years whose pathology originates, primarily, from

the community, and among these cases, about 11 to 20 million evolve with significant injuries requiring hospitalization.⁸⁻⁹

Regardless of age group, environmental and behavioral exposures, such as exposure to tobacco smoke and poor air quality (pollutants), several comorbidities act together to increase susceptibility to pneumonia. In the case of adults and the elderly, nutritional deficiencies, chronic respiratory diseases (asthma and chronic obstructive pulmonary disease), other chronic conditions (type 2 diabetes mellitus, chronic liver disease, kidney disease, and heart failure), dysphagia, poor oral hygiene, alcohol, and drug abuse have been associated with a high risk of pneumonia, because they act as stressing agents for physiological functioning.¹⁰

While in children under 5 years of age, poor socioeconomic conditions, malnutrition, vitamin deficiencies, incomplete vaccination, prematurity or low birth weight, and lack of breastfeeding, constitute the aggravating factors of the general state of health and are related to the increased risk of pneumonia.¹¹

Based on the descriptors, the SciELO, PubMed, and Virtual Health Library platforms found that the publications mostly deal with the occurrence of pneumonia in children under 5 years of age, and no study brings the profile about the pathology. This absence remains when filtered by studies related to the state of Bahia and Brazil.

In the period from 2015 to 2019, according to the Hospital Admissions System – HAS, Brazil counted 3,099,647 cases, and the state of Bahia has 183,828, which corresponds to approximately 6% of the national number.¹⁰

In this interim, pneumonia was observed as the major cause of injuries in hospitalizations for respiratory diseases.⁸ In addition, the outbreak caused by the SARS-CoV2 virus (Covid-19) in Hubei Province, China, warns about the need for research on respiratory pathologies, especially regarding injuries to the general health status of hospitalized patients.¹¹

Since pneumonia has been characterized as a diffuse lung disease with an affinity for pulmonary parenchyma, pneumonia has been a condition due to organic fragility caused by SARS-CoV-2 infection. To the same extent, the diagnosis can be interlaced, with the concomitance of pathologies by the therapeutic intervention (e.g., mechanical ventilation) and hospitalization (hospital/nosocomial).¹²

Thus, the knowledge about the epidemiological situation of hospital admissions for pneumonia in the State of Bahia becomes relevant for the screening of the vulnerabilities of the study population. Thus, this study aimed to describe the epidemiological profile of hospital admissions due to pneumonia in the State of Bahia, in the period from 2015 to 2019.

Methodology

This is an ecological, descriptive, and retrospective study, with the extraction of secondary data. The data obtained refer to the State of Bahia from January 2015 to December 2019. The collection took place through the following sequence: TABNET > Epidemiological and Morbidity > Hospital Morbidity of the SUS (HAS/SUS) > General, by place of residence from 2008 > Bahia. Such data are linked and made available by the Department of Informatics of the Unified Health System (DATASUS), at the e-mail address (<http://www.data-sus.gov.br>), and the collection occurred in July 2020.

Information regarding hospitalizations for pneumonia during the given period was considered. The period was delimited until 2019 because it was the most current year in which the data were complete by the time of the survey. The variables used were those that already existed in the system related to pneumonia, with some adaptations: age group, color/ethnicity, sex, and health macro-regions.

In the area of health, Bahia territory has 417 municipalities, which are arranged in nine macroregions (28 health regions), namely North (28 municipalities), West (36 municipalities), North-Central (38 municipalities), Central-East (72 municipalities), Northeast (33 municipalities), East (47 municipalities), Southwest (74 municipalities), South (68 municipalities) and Extreme South (21 municipalities).¹³

The dataset for analysis was selected and obtained through the TABNET application, linked to DATASUS, from its options boxes (row, column, and content). The data were transferred to the Excel software of the Microsoft Office 2016 package and statistically analyzed using absolute frequency, mean, as well as percentage indicators.

Because it is a public domain database, there is no risk of exposure, and it is not necessary to submit the project to the Research Ethics Committee.

Results

The collected indicators were organized into four tables differentiated between the variables elucidated in the data analysis. The total amount for the period highlights the annual oscillation, starting with 24,844 cases in 2015 and ending with 25,732 cases in 2019, accounting for 121,530 cases of hospitalization for pneumonia. It is noteworthy that the period analyzed has an increase in hospitalizations in 2018 compared to the previous year, accounting for 27,888 cases in the state of Bahia.

When analyzing the data collected by the division into macroregions (Table 1), it is observed that in the macroregions of the Southwest (74 municipalities) and South (68 municipalities), 24,488 and 21,296 cases, respectively. The variation ranged from 14.3% to 25.1%, with an average of 20.48% for the Southwest, and from 16.1% to 18.3%, with an average of 17.5% for the South.

Table 1. Hospitalizations for pneumonia by macro-region of health in the state of Bahia, Brazil, 2015 to 2019

Health Macroregion	2015		2016		2017		2018		2019	
	n	%	N	%	n	%	n	%	n	%
Regional Health Center South - Ilhéus	4257	17.1	3355	17.9	3917	16.1	5058	18.1	4709	18.3
Regional Health Center Southwest - Vitória da Conquista	5907	23.8	4694	25.1	4935	20.3	5273	18.9	3679	14.3
West Regional Health Center - Barreiras	1374	5.5	787	4.2	2051	8.4	3278	11.8	2968	11.5
North Regional Health Center - Juazeiro	2250	9.1	1385	7.4	1598	6.6	1823	6.5	1473	5.7
Northeast Regional Health Center - Alaginhas	906	3.6	618	3.3	621	2.5	714	2.6	881	3.4
East Regional Health Center - Salvador	2349	9.5	2619	14.0	3681	15.1	3519	12.6	3683	14.3
Regional Health Center Extreme South - Teixeira de Freitas	2084	8.4	1511	8.1	2203	9.0	1767	6.3	1536	6.0
Central East Regional Health Center - Feira de Santana	4093	16.5	2877	15.4	3238	13.3	3683	13.2	3779	14.7
Regional Health Center North Center - Jacobina	1624	6.5	858	4.6	2118	8.7	2773	9.9	3024	11.8
Total	24844	100.0	18704	100.0	24362	100.0	27888	100.0	25732	100.0

Source: Ministry of Health - SUS Hospital Information System (HIS/SUS).

Regarding the age groups presented in Table 2, the groups with the highest number were between early childhood (1 to 4 years) and in elderly individuals over 80 years of age. In the age group from 1 to 4 years, the total number of cases corresponded to a variation of 23.4% to 26.3%, with an average of 24.6%. Among the elderly over 80 years of age, the variation was 12.2% to 15.7%, with an average of 14.1%, of the total number of hospitalizations in the state of Bahia. The age group between 15 and 19 years, which corresponds to adolescents, has the lowest percentage (2.4%).

Table 2. Pneumonia hospitalizations by age group in the State of Bahia, Brazil, 2015 to 2019

Age Group	2015		2016		2017		2018		2019	
	n	%	n	%	n	%	n	%	n	%
under 1 year	4958	11.5	3632	11.2	3749	10.5	3990	10.6	3516	10.0
1 to 4 years	10365	24.1	8500	26.3	9080	25.4	8945	23.8	8183	23.4
5 to 9 years	3316	7.7	2677	8.3	2968	8.3	3280	8.7	2897	8.3
10 to 14 years	1490	3.5	1226	3.8	1113	3.1	1443	3.8	1212	3.5
15 to 19 years	1168	2.7	800	2.5	768	2.1	875	2.3	846	2.4
20 to 29 years	1865	4.3	1327	4.1	1182	3.3	1424	3.8	1392	4.0
30 to 39 years	2084	4.8	1492	4.6	1439	4.0	1693	4.5	1565	4.5
40 to 49 years	2203	5.1	1537	4.7	1600	4.5	1736	4.6	1675	4.8
50 to 59 years	2691	6.2	1983	6.1	2055	5.7	2222	5.9	1982	5.7
60 to 69 years	3110	7.2	2372	7.3	2700	7.6	2718	7.2	2637	7.5
70 to 79 years	4106	9.5	2878	8.9	3690	10.3	3844	10.2	3621	10.3
80 years and over	5703	13.2	3939	12.2	5406	15.1	5477	14.5	5483	15.7
Total	43059	100.0	32363	100.0	35750	100.0	37647	100.0	35009	100.0

Source: Ministry of Health - SUS Hospital Information System (HIS/SUS).

According to the data presented in Table 3, the highest frequencies of hospitalizations were in males in all years analyzed, ranging from 51.5% to 52.5% with an average of 51.9% of total hospitalizations in the State of Bahia. It is worth noting that 2016 recorded a decline in the general rates for both sexes.

Table 3. Hospitalizations for pneumonia by sex in the State of Bahia, Brazil, 2015 to 2019

Sex	2015		2016		2017		2018		2019	
	n	%	n	%	n	%	n	%	n	%
Male	22261	51.7	16998	52.5	18595	52	19606	52.1	18041	51.5
Fem	20798	48.3	15365	47.5	17155	48	18041	47.9	16968	48.5
Total	43059	100	32363	100	35750	100	37647	100	35009	100

Source: Ministry of Health - SUS Hospital Information System (HIS/SUS).

Among the variations described in Table 4, there is a higher frequency of brown color that counts 23,797 reported cases, ranging from 82.8% to 86.3% with an average of 84.8%, and the black color accounts for 5,186 of the reported cases, ranging from 3.8% to 4.6% with an average of 4.26%, of the total number of hospitalizations in the State of Bahia. The indigenous group totals 66 reported cases, ranging from 0.0% to 0.1% with an average of 0.06% of the cases.

Table 4. Pneumonia admissions by color/race in the state of Bahia, Brazil, 2015 to 2019

Color/race	2015		2016		2017		2018		2019	
	n	%	n	%	n	%	n	%	n	%
White	2591	10.4	1597	8.5	1944	8.0	2052	7.4	1769	6.9
Black	1134	4.6	709	3.8	970	4.0	1251	4.5	1122	4.4
Brown	20577	82.8	15797	84.5	20759	85.2	23797	85.3	22200	86.3
Yellow	534	2.1	588	3.1	678	2.8	773	2.8	622	2.4
Indigenous	8	0.0	13	0.1	11	0.0	15	0.1	19	0.1
Total	24844	100,0	18704	100,0	24362	100,0	27888	100,0	25732	100,0

Source: Ministry of Health - SUS Hospital Information System (HIS/SUS).

Discussion

The oscillation with an increase in cases observed over the period reaffirms the applicability of the study on the epidemiological profile, the object of the present study, being proven by 121,530 cases of hospitalization for pneumonia in the State of Bahia, peaking in 2018 and declining in 2016.

Among the macroregions of Bahia, the Southwest and South regions have the highest rates of variation in hospitalization for pneumonia, increasing in cases mainly in the first the period from 2015 to 2018, with a reduction in 2019 and the second, despite the variation over the period, remains above the others. Except when a constant was found, it is not possible to delimit an increasing or decreasing of cases.

One point that should be highlighted is that this finding may be tied to the climate in the region, which has a mild environment with long rainy periods marked by the reduction of temperature and variation of the relative humidity of the air. Low temperatures contribute to the increase in hospitalizations for pneumonia in subtropical regions, highlighting the winter months.⁷ This condition brings these sites closer to the scenario seen in the southeast region of the country, where respiratory infections have a greater influence on the population health conditions and take responsibility for the highest percentage of deaths in Brazil.¹⁴

When analyzing data on age groups, it is evident that hospitalization for pneumonia is more frequent in children aged 1 to 4 years. Thus, the Bahian scenario is consistent with that experienced worldwide because the highest rates of hospitalization for pneumonia occur in children up to 4 years old, a moment of life marked by all initial contacts with the environment, that is, the exposure of the developing organism to the pathological agents that cause the most diverse infections.⁷

It is important to emphasize that in this age group pneumonia is an important cause of mortality, causing about 300,000 deaths per year worldwide, mainly in low and medium-developing countries, according to a survey by the Pan American Health Organization (PAHO).⁵

Policies for the preservation of child health and immunization indicate that the incidence of malnutrition, low birth weight, early interruption of breastfeeding, and noncompliance with the vaccination schedule, such as pentavalent, pneumococcus, and influenza, are aggravating factors for the development of the organism and consequently of its defenses.^{1,7}

Another aspect no less relevant is that the prevention of pneumonia in children is an essential component to reduce infant mortality and that the measures constitute adequate nutrition, exclusive breastfeeding during the first 6 months of life, complete immunization, improvement of air, and hygiene in the domestic environment.^{7,15} The World Health Organization states that effective diagnosis and treatment of pneumonia are essential to improve child survival.¹⁵

At another end of life, the elderly population has inherent weaknesses in senescence and aggravated in cases with senility.¹⁶ According to Santos et al.¹⁷, adolescents and adults show complications due to milder pneumonia when compared to individuals in the most extreme age groups, the elderly and children.

The elderly present greater fragility over respiratory tract infections, leaving vaccination prevention and maintaining healthy habits to avoid comorbidities, such as exercise, regular and adequate feeding, absence and/or control of smoking and alcohol consumption.¹⁶

Linked to the male behavioral pattern, according to Silveira et al.¹⁸, cultural issues associated with gender are observed, in which many men do not have the habit of taking care of health, with vulnerable exposure, in addition to when seeking medical care, the diagnosis is late and the disease is already in an advanced state, requiring more specific tests and more expensive treatments. The lack of this preventive posture is an aggravating factor for health care.

In Bahia, according to data from the last sense made by the Brazilian Institute of Statistical Geography – IBGE¹⁹, the number between males and females does not suffer great variation between age groups, except for those over 80 years of age who have a higher number of female individuals, and the phase of life with greater fragility to the risk factors of pneumonia is last. Despite most females being older than 80 years, hospitalization data do not change, reaffirming the prevalence of behavioral factors, as stated above, and this determinant is the contraction of pneumonia mostly of community origin.¹⁷

In the case of data collected from the color/race variable, it is evident the underreporting of this characteristic, because it does not have a mandatory/compulsory character to the patient/user/client, bringing to the system a fragility of the data, despite the obligation of the State to promote means for racial ethnic declaration. The indigenous population is noted for the difficulty accessing health teams in villages and places of residence in general, causing the lack of sufficient data to measure the exposure of this portion of the Bahia population.²⁰ It is worth mentioning that, in the case of Bahia territory and the

history of a mostly black population, the low number may be due to the non-declaration expressed for color/race due to structural issues.²¹

The variable color/race brings a duality to the interpretation of the indicators because the self-declaration is non-mandatory and the precariousness of the data in the identification via the system makes it impossible to survey to formulate the general percentage. Considering the relationship between the event of pneumonia with the social determinates of health and knowing that much of the black population may have socioeconomic deprivation, this indicator must be fully available for a more reliable evaluation.

It is noteworthy that the epidemiological profile on hospitalization for pneumonia in the State of Bahia observed the period between the years 2015 to 2019 has a fragility regarding ethnic identification, and it is up to health teams to stimulate data collection with the hospital admission procedure.²²

Finally, the duration of hospitalization can be a factor in the transmission of infection by nosocomial pneumonia, an opportunistic disease to the frailties of individuals undergoing hospital treatment, being one of the main risk factors for the prolonged exposure of the patient to the environment.²³

The limitation factors of the epidemiological profile were the fragility of the data related to race/color, given the gap in self-declaration and identification by health professionals, in addition to the problems of the incompleteness of the data due to underreporting, especially in small municipalities that present difficulties related to the use and access of information and communication technologies.

It should be emphasized that the information collected from the online database of the Unified Health System expresses the scope only in hospitalizations in public health services, excluding hospitalizations in private services, not captured by DATASUS. Similarly, the absence of published studies aggravated the comparative picture of the epidemiological profile, besides compromising the evaluation of different climates.

Conclusion

The study above reaffirms that respiratory tract infection caused by pneumonia is one of the pathologies that most motivate hospitalization, and the influence of the selected variables is evident, highlighting, among them, the age group that identifies the extremes (children and elderly) as the largest group vulnerable to infection and, therefore, hospitalization.

Males are the ones who most evolve with the infection promoting their hospitalization. When dealing with macroregions, there is a discrepancy possibly related to climatic conditions (South and Southwest), with the Southwest macro-region being the most prevalent.

After the analysis of the variables raised, it is concluded that there was a gap in the indication of color/race, at first motivated by the non-obligation, followed by the deficit of voluntary manifestation of the population in characterizing itself with an ethnic group, in addition to the low coverage on the indigenous population.

In a current-day bias, the study of the epidemiological profile of hospitalizations due to pneumonia will help in understanding the dimensions and weaknesses of the respiratory tract, adjusting the performance of health professionals in coping with the pandemic of Covid-19, which indicates the need for more research that investigates the correlation between pathologies, expanding the understanding of complications and supporting preventive interventions.

Authors' contributions

Oliveira GM, Costa JG, Coni ROS and Almeida VSM participated in the conception, design, search and statistical analysis of research data, interpretation of results, writing of the scientific article, collection of research data, interpretation of data. Cardoso ACC and Brazil CA participated in the orientation and helped in the structuring of the article.

Conflicts of interests

No financial, legal or political conflicts involving third parties (government, companies and private foundations, etc.) were declared for any aspect of the submitted work (including, but not limited to grants and funding, participation in an advisory board, study design, preparation manuscript, statistical analysis, etc.).

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