

Risk Factors for Pneumonia in patients less than five years old. Punta Gorda, 2012

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Abstract

INTRODUCTION. Pneumonia is a major cause of morbidity and mortality worldwide and in many cases, associated with risk factors that can be modified. **OBJECTIVES.** Identify risk factors for pneumonia in the patient under five years evaluated at Punta Gorda. **Material and METHODS.** A descriptive study was conducted at Punta Gorda, in the period from July to December of 2012 which analyzed different variables: risk factors such as age, sex, smoking by household members, overcrowding, low birth weight and malnutrition and severity thereof. **RESULTS.** Approximately one-fourth of the children had severe pneumonia; the most important risk factors were overcrowding, malnutrition and low weight. **CONCLUSIONS.** Patient's sex, smoking by household members, overcrowding and malnutrition acted as the main risk factors for pneumonia onset in children under five.

Key words:

Pneumonia, prediction or risk factor, children under five years-old.

■ INTRODUCTION

Acute respiratory infections (ARI) are a complex and heterogeneous group of diseases caused by different microorganisms that, concomitantly or sequentially, affect different parts of the respiratory system [1].

ARIs are described according to the most affected location and where signs and symptoms predominate. They are classified by anatomical site into upper respiratory tract infections (common cold, acute middle otitis, acute adenoiditis, acute tonsillopharyngitis, and acute sinusitis) and lower (acute laryngitis, bronchiolitis, acute bronchitis, pneumonia, and bronchopneumonia) [1].

Pneumonia is a major health problem; together with influenza, it ranks fourth as cause of death in all ages, exceeded only by cardiovascular, malignant, and cerebrovascular diseases [2]. This is not only because of the impressive morbidity

and mortality figures, especially in developing countries and mainly during the first year of life; but also because of the damage resulting from work and school absenteeism, health care needs, use of medications and the social effects of suffering and loss of human lives b.

In 1966, Dr. Derrick Jelliffe referred to diarrhea, pneumonia and protein calorie malnutrition as “the killer triad” of childhood exterminating diseases. Unlike the other two, ARIs affect all countries and all ages. The difference between children in developed countries and in developing countries lies, not in the number of episodes, but in their severity, in the greater risk of acquiring pneumonia and dying in the course of an ARI. Given the magnitude of the problem posed by these infections, the 29th World Health Assembly decided to create in 1976 the global Acute Respiratory Infection (ARI) Control Program, which became official in 1984 [4–6].

A 1998 publication states that acute respiratory infections are a forgotten pandemic. Their high mortality constitutes an international disgrace; because there are measures to prevent these deaths, such as immunization and antibiotic treatment. [7]

In the region of the Americas, acute respiratory infections (ARIs) are among the five most common causes of mortality in children under five. Every year about 140 to 150 thousand children under five years die from acute respiratory infections in this region, of which 100 thousand are under one

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year of age and 40 to 50 thousand are between 1 and 4 years old [5,7].

While deaths from acute respiratory infections (ARIs) constitute 1–3% of deaths in developed countries, in some countries of Latin America and the Caribbean, this figure rises to 15–20%. Like in rest of the world, 80 to 90% of ARI deaths in the American countries are caused by pneumonia, and because of the above mentioned most of them occur in the poorest countries of the continent [2].

WHO and UNICEF have recently created new organizations to reduce child pneumonia mortality such as the Global Action Plan for Prevention and Control of Pneumonia (2009), and in April of the current year the Integrated Global Action Plan for the Prevention and Control of Pneumonia and Diarrhea. Despite the reduction in child mortality, more recent figures show that in 2011, 1.3 million children died from pneumonia, accounting for 18% of overall child mortality in that year alone [10].

The most frequent etiologies include respiratory viruses, among them, respiratory syncytial virus (RSV), influenza A and B, parainfluenza 1, 2 and 3, and adenovirus (ADV) and occasionally, or as complications of the viral infection, bacterial infections occur; the most common being *Pneumococcus* and *Haemophilus influenzae*. [6,12–15].

Risk is a measure of the probability of an event or damage occurring (illness or death) [19–26]. It is essential to properly interpret the presence or influence of risk factors.

Different risk factors, which influence the occurrence of acute respiratory infections in children under one year of age, are presented below [2,6,13,19–24]:

- Age: Most ARI deaths occur during the first year of life, especially in the first 6 months, due to lack of maturation of the respiratory tract and its defense mechanisms, which favor greater severity and predisposition to acute respiratory failure.

- Sex: Male gender is most affected, for an, as yet, undetermined cause.

- Low birth weight: Pre-term babies or those with low birth weight (>2500 g) for gestational age, found in over 15% of births, are less mature and their respiratory system has less defensive capacity than normal counterparts [18]. According to WHO, low birth weight, especially in infants born at term constitutes one of the two most significant risk factors increasing death risk by more than seven times.

- Malnutrition: Severe malnutrition leads to immunological impairment, depresses local defenses and is the second most important risk factor, according to WHO. Child malnutrition should not only be considered a risk factor in its quantitative aspect: underweight for their size or age, or decreased lean or fat mass; deficiency of some micronutrients: vitamins and minerals, qualitative malnutrition, also favors severe ARIs [25].

- Lack of breastfeeding: Breast milk is the ideal infant food, covering their needs. Lack of breastfeeding, early weaning or digestive intolerance promotes ARI. Infants not breastfed are 15 times more likely to die due to pneumonia than are exclusively breastfed children.

- Lack of immunization: Many vaccine-preventable diseases

cause pneumonia or respiratory complications leading to mortality. The basic vaccination schedule proposed by WHO prevents diphtheria, whooping cough and measles, and although immunization has extended in many regions, epidemics of these diseases occur in developing countries and outbreaks emerge in countries that stopped vaccinating.

- Chronic diseases: There is a group of diseases that reduce local or systemic defense mechanisms, favoring pneumonia: lung, digestive or cardiac malformations, cystic fibrosis, bronchial asthma, etc.

- Socioeconomic status of the family: Inadequate living conditions favor severe ARI. Several factors interact: poor ventilation and overcrowding enhance ARI transmission; low parent education, low income per capita is associated with inadequate care, poor feeding and family instability.

- Environmental contamination: The child spends most of the time at home, and the presence of contaminants in this environment must be avoided. In children born to mothers who smoked during pregnancy, structural alterations in the lungs have been described.

- Child care institutions: When the child attends a day-care center or nursery, the risk of transmission of viral ARIs and nasopharyngeal colonization with pathogenic bacteria increases. [2,14,16–24,26].

Given the abovementioned, our purpose was to identify pneumonia risk factors in patients less than five years old evaluated at the Punta Gorda Hospital and to relate these factors with disease severity.

■ MATERIALS AND METHODS

A descriptive study was carried out from July to December of 2012 at the Punta Gorda Hospital in patients less than five years of age with a diagnosis of pneumonia.

The study universe consisted of all patients younger than 5 years of age with a diagnosis of pneumonia. It was considered that a patient had pneumonia when presenting symptoms and signs compatible with infection of respiratory structures of any location and/or radiological diagnosis. Patients whose medical records did not have all the data to fill the form were excluded.

During the study period, the medical records of 37 patients diagnosed with pneumonia were reviewed. Demographic and clinical variables such as age, sex, smoking habits of the household members, overcrowding, low birth weight, malnutrition, as well as disease severity, which could be associated to development of pneumonia, were selected. Age was divided into 2 groups: under 1 year and from 1–4 years

Sex: male and female

Smoking habits: The child was considered passive smoker if any person in the house smoked.

Overcrowding: When there are two or more persons living in a room.

Low birth weight: Any patient whose birth weight was less than 2250g.

Malnutrition: Referring to malnutrition by defect or risk of malnutrition.

The risk factors were associated with disease severity considering two categories: severe or not severe.

The patients' data were gathered in questionnaires prepared for this purpose. An Excel database was made with all the information, allowing to process and tabulate data, and show the results in numbers and percentages. Tables were then prepared, in which the different risk factors were associated to pneumonia severity.

Only the author of this study had access to the documentation ensuring privacy and that this information will not be used for any other investigation.

RESULTS AND DISCUSSION

Assessing pneumonia severity (Table 1), approximately one fourth of the cases were severe (21.6%), which is consistent with the literature. This is related to several factors, among them anatomical and physiological characteristics of the infant's respiratory system, in which a smaller diameter of the peripheral airways, leading to obstruction by inflammation and secretion, reduced compliance of the lung, and earlier diaphragmatic fatigue, make cough less effective in the removal of secretions from the lower airways. Susceptibility to infection together with immunological immaturity and existence of prior illness may be included [13,21–24,27].

Table 2, relating clinical condition, age and sex, shows that the most affected age group was 1–4 years with 32 cases for an 86.5% overall. This is related to various factors already mentioned. These data are consistent with studies by other authors [15,30,31].

Regarding sex, among the severe and not severe cases, males predominated with 73.0%. These results agree with the literature, which reports male predominance even for the risk of severe pneumonia for, as yet, undetermined reasons. Some authors have suggested that males are more sensitive to the changes and/or alterations in the environment, which places them at disadvantage to face infections.

Prieto Herrera [11] reports that the severity of infection is higher in boys, without a scientific explanation. The risk attributable to males is demonstrated by two case-control studies of pneumonia in Brazil confirming the higher risk attributed to male sex.

The relationship between disease severity and smoking (Table 3) shows that of the 37 patients, 33 (89.1%) had at least one smoker in the house. The literature suggests that cigarette smoking increases children's risk of pneumonia by 6–7 times causing disorders in the function and anatomy of the respiratory system. Passively inhaled smoke contains toxic substances that affect the mucociliary clearance mechanism and macrophage activity, increasing the production of mucus [15, 20–22,27,41].

It has been shown that children exposed to smoking in their homes have double risk of lower respiratory tract infection in the early years of life. According to Fernández Salgado, the situation worsens when both parents smoke with reports of an average of 12.1 consultations and 1.6 hospitalizations per year [40].

Table 4 shows that overcrowding was determinant for all cases, independent of the clinical outcome; all patients lived in overcrowded environments. This risk factor promotes the

Table 1: Distribution of pneumonia patients according to severity

Clinical condition	Number	%
Severe	8	21.6
Not severe	29	78.4
Total	37	100

Source: Questionnaires, N = 37

Table 2: Relation of clinical condition with age and sex of the patients

Clinical condition		Variables			
		< 1 year	1-4 years	Male	Female
Severe	No.	1	7	7	1
	%	2.7	18.9	18.9	2.7
Not severe	No.	4	25	20	9
	%	10.8	67.6	54.1	24.3
Total	No.	5	32	27	10
	%	13.5	86.5	73.0	27.0

Source: Questionnaires, N = 37

Table 3: Relationship of clinical condition with smoking

Clinical condition	Smoking	
	No	%
Severe	7	18.9
Not severe	26	70.2
Total	33	89.1

Source: Questionnaires, N = 37

Table 4: Relationship of the clinical condition with overcrowding

Clinical condition	Overcrowding	
	No	%
Severe	8	21.6
Not severe	29	78.4
Total	37	100

Source: Questionnaires, N = 37

development of pneumonia by exposure to micro environmental factors and the dissemination of Pflüger microdroplets; the infants are the most affected by contact with them because of their more deficient immune status compared to adults. In these aerosol transmissions, close contact with an infected person is the main cause of the infection.

In the association of the clinical condition with low weight and malnutrition, Table 5 shows that 17 of the 37 patients had low weight and 33 of the 37 children had risk of mal-

Table 5: Relationship of the clinical condition with low weight and malnutrition

Clinical condition	Low weight		Malnutrition		Total	
	No	%	No	%	No	%
Severe	5	29.4	4	25.0	9	27.3
Not severe	12	70.6	12	75.0	24	72.7
Total	17	100.0	16	100.0	33	100

Source: Questionnaires, N = 37

nutrition by defect. For both risk factors the proportion of patients with severe outcome was close to one third. Malnutrition was highest in children with severe outcome (27.3%). It is possible to observe a child with both underweight and undernourishment. The literature indicates that acute respiratory infections and nutrition have a double connection, because malnutrition renders children more vulnerable to respiratory infections. On the other hand, if sick children are not properly fed, acute respiratory infections may cause stunted growth and development, weight loss and malnutrition, and increase susceptibility to other infections. It has been suggested that malnutrition causes thinning of the pulmonary membrane and impairment of the immune system, rendering bacteria entry easier. This is consistent with other references consulted and other studies carried out in Peru that found relation between the ARI's and malnutrition.(28, 31–38).

■ CONCLUSIONS

Of the studied cases, one-fourth of them had a severe form of pneumonia, as described in other studies. Male sex predominated, both overall (73.0 vs. 54.1%) and among severe cases (18.9 vs. 2.7%). Children in the 1–4 years age group were the most affected, 86.5% of the cases. Exposure to cigarette smoke and overcrowding were predictive risk factors in our study. Malnutrition and underweight determined the development of pneumonia in children. Control of these risks factors plus vaccination could prevent a large proportion of these children from becoming ill or having a poor outcome.

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