The role of ecosystem factors in the appearance and evolution of acute/chronic bronchiolitis in children

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Rezumat

Obiectivul acestui studiu este de a evidentia relatia patogenica dintre ecosistemul copilului si bronsiolita acuta.

Studiul este o analiza retrospectiva pe o perioada de 4 ani pe un lot de 870 de copii cu varsta cuprinsa intre 4 luni si 2,6ani. Urmatorii parametrii au fost analizati: mediul de viata al copilului, climatul, backgroundul biologic (anemie, distrofii, rahitism), particularitati progresive si forme clinice ale bolii.

Rezultate si concluzii: Studiul arata care sunt factorii non-biotici din ecosistemul copilului care influenteaza statusul biologic al acestuia. Habitatul precar a fost prezent in 65,7% din cazuri, dintre care mai mult de jumatate au dezvoltat forme severe de boala. Mediul urban este dominant (in 60% din cazuri) si este legat de evolutia severa a bolii in 50,95% din cazuri. In mediu rural si precar, recurentele au fost intalnite intr-o proportie de 6,97% iar recaderiole intr-o proportie de 8,37% dintre cazuri.

Tratamentul precoce duce la vindecarea bolii in proportii relativ egale in cele doua medii: 67,81% in mediul urban si 65,22% in mediul rural.

Sezonul rece favorizeaza bronsita acuta intr-o proportie de 59,25%, din care 52,21% vor dezvolta forme severe de boala, favorizand recurentele si recaderile si prelungind astfel procesul de vindecare.

Statusul biolocic alterat are o influenta negativa, favorizand infectiile acute respiratorii.

Abstract

The objective of the study was to underline the pathogenic interrelation between child's ecosystem factors and acute bronchiolitis.

The study protocol envisaged a retrospective analysis over a four year period on a cohort of 870 children with ages between 4 months and 2.6 years old. The following parameters were analyzed: child's habitat, origin environment, climatic season, biological background (anemia, dystrophy, rachitism), progressive particularities and clinic forms of disease.

Results and conclusions:

The study shows what non-biotic factors of the child's ecosystem ultimately influence his biological state.

The precarious habitat was present in more than 65.87% of the cases, of which more than half developed severe forms of disease. The urban environment is dominant (in 60% of the cases), which is linked to the evolution of severe forms of disease in a percentage of 50.95. In a precarious habitat and the rural environment, recurrences are met in a proportion of 6.97% and relapses in 8.37% of the cases.

Precocious treatment led to healing in similar proportions for both environments: 67.81% for the urban one and 65.22% for the rural one.

The cold season favored the acute bronchiolitis in a proportion of 59.25%, of which 52.21% would evolve in severe forms, delaying the healing process and encouraging recurrences and relapses.

The modified biological background has a negative influence on patient's biological state, favoring acute respiratory infections.

Introduction

Acute bronchiolitis (BA) is a bronchiole-obstructive syndrome of mostly viral etiology, characteristic for babies and infants, which manifests a clinic pattern that begins with: rhinorea, coughing, fever or hypothermia, anorexia and a degradation in general health. During the days that follow contamination, step by step, the symptomatology from the early stages becomes more obvious; thus the rhinorea initially serous and in small amounts becomes mucus-purulent and in large amounts; the hollow cough becomes spastic, irritant and sometimes even emetizant. Besides these the prolonged expiration and wheezing appears, together with sibilant and snoring respiratory noises, cyanosis, anorexia, nourishment refusal, irritability or somnolence, vomiting or abdominal flatulence.

Tabelul 1

Etiologia bronșiolitei acute[24]

Agent etiologic	Frecvența relativă (%)
Virus respirator sincițial	>50
Virusuri paragripale	25
Adenovirusuri	5
Rinovirusuri	5
Virusuri gripale	5
Enterovirusuri	2
Virus herpes simplex	2
Virus urlian	<1
Mycoplasma pneumoniae	5

The disease etiology is mainly caused by the syncitial respiratory virus (VRS) in more than half of the cases. In a reduced proportion the disease can be released also by potential infections with: para-flu virus 3, the adenovirus (case in which the disease is associated with severe complications at distance, including obliterated bronchiolitis and the syndrome of hyper-transparent unilateral lung or the syndrome Swyer-James), rhinoviruses and Mycoplasma pneumoniae.

There is no certain proof regarding the connection between a bacterial infection and the appearance of bronchiolitis, although in a few cases an initial bronchiolitic episode has been followed by a bacterial supra-infection or a bacterial pneumonia was mimed.

There are at least two types of syncitial respiratory virus of which the A form is the most aggressive. The A subtype infections have a high frequency and cause the severe cases of BA due to a decreased level of the immunologic reply. The virus antigenic configuration negatively influences the production of interferon & IL1 and Ig As, but facilitates the phenomena of cellular hyper-sensitivity process and a high production level of reagina, which is an antibody involved in the reactions of immediate photosensitivity: antibody IgE.

The disease epidemiology shows a high level of cases in the cold and wet seasons until the child is 2 to 2, 6, with an epidemiologic peak around the age of 4 to 6 months.

The immunologic particularities (low Ig As, low immunologic response to viral infections, low maternal IgG, etc) and the small dimensions of bronchioles are the main causes in appearing the acute infectious process at bronchioles level, with a secondary development of a certain clinical-biological pattern.

The infection is the result of child's direct contact with the patient in an acute stage which can transmit the viral infection through the inoculation of the nasal or ocular mucous membrane, from where the infections is transmitted descending from cell to cell through intercellular bridges or syncitial structures (multi-nucleus cells).

The virus rejoins in the respiratory epithelium, generates the cellular meiosis and peri-bronchial mononuclear infiltrate. The edema of sub-mucous membrane, local hyper secretion, cellular detritus and the production of local fibrin generate the appearance of plugs locally obstructed and emphysema or parcel like ateltectasias.

When the virus acts directly there are associated immune-allergenic mechanisms which supplement the pathologic mechanism of the direct viral infection.

The increased aggressiveness of the syncitial respiratory virus would be the result of the following effects:

-the production of interferon & in the body decreases and it influences the defending potential of the body

- participates to inhibiting interleuchina through collateral mechanisms

- facilitates cellular hyper reactivity and increased production of IgE

- weakens the immunological general response to the viral infection with the syncitial respiratory virus, facilitating re-infections and relapses (decreases in IgAs, Ig G etc).

Acute bronchiolitis is regarded with great interest for the pediatric practice due to:

- High incidence
- Weak and unpredictable evolution
- High frequency of relapses and recurrences
- Economic costs involved with the treatment

The obiective of the study consisted in establishing and underlining the connection between the acute bronchiolitis and the factors of child's ecologic system in the view of the appearance and evolution of the disease.

Material si method;

– he study has been observed retrospectively on a period of 4 years.

– he cohort of patients was formed of 870 children with ages between 2 months up to 2 years, hospitalized in the Pediatrics Clinic II Arad.

The study analyzed the following parameters of the child's ecosystem:

abitation general conditions (proper -improper)

hild's origin environment (urban / rural)

he season of appearance of BA (warm/cold)

he biologic background on which BA developed (anemia, rachitism, dystrophy, prematurity)

he clinical form of the disease (common / severe , with marked acute respiratory insufficiency)

volution particularities – duration and cure up to 14 days or more than 14 days

ecurrences/reappearance of clinical symptomatology of BA in convalescence

ecurrence–reappearance of BA after 6 to 8 weeks from discharge.

Results;

T

a) 2
97 (34,13%) cases had proper habitat conditions,

T

57 (52,86 %) of the cases presented common forms of disease

40 (47,13%) of them had severe forms of BA with proper habitat conditions

b) h 1
96 (65,99%) patients cured in the first 2 weeks from the debut of the disease

c) 1
01 (34%) exceeded this limit

d) 1
9 (6,39%) presented relapses

e) 1
2 (4,37 %) had been recurrent

f) **5**
73 (65,87%) cases had medium and precarious habitat conditions

1. 290(50,60%) presented common forms of BA
2. 283 (49,40%) had severe forms with IRA

g) T
he number of patients who were cured was of:

1. 87 (67,50%) up to 14 days and
2. 86 (32,50%) more than 14 days

h) R
elapses had been met in 48 (8,37%) cases and

i) R
ecurrences in 40 (6,97%)

522 (60%) cases appeared in the **urban environment** and 348 (40%) in the **rural environment.**

Regarding the **clinical forms** there were:

- 256 (49,04%) cases of chronic type of BA
- 266 (50,95%) cases of BA with IRA in the urban environment
- 200 (54,47%) cases of the common form of BA
- 148 (42,52%) cases of BA with IRA in the rural environment.

The curing process took place as following:

In the urban environment

- 354 (67,81%) cases cured in less than 14 days
- 168 (32,09%) cases cured in more than 14 days from the appearance

In the rural environment;

- 227 (65,22%) cases cured in the first 2 weeks
- 121 (34,77%) after 14 days

Relapses have been present in;

- 22(4,21%) cases in the urban environment
- 15(4,31%) cases in the rural environment

Recurrences have been present in;

- 28(5,36%) cases in the urban environ 3
- 25(7,18 %) cases in the rural environment

During the cold season; 1

- 519 (59,65%) cases became ill

During the warm/hot season;

- 351 (40,34%) cases became ill

Interpreting from the clinical form of the disease point of view:

- 248 (47,78 %) cases presented common forms of BA in the cold season and
- 208 (59,25%) cases in the warm season.

The severe forms associated with IRA were present in the cold season in:

- 271 (52,21%) cases
- 143 (40,73%) cases in the warm season.

The curing process took place in the first 2 weeks at a number of:

- 328(63,19%) patients in the cold season and
- 253(72,07%) patients in the warm season.

After 14 days of treatment the curing process was done in:

- 191(36,80%) cases during the cold season and
- 98 (27,92%) cases during the warm season.

Relapses occurred in:

- 31 (5,97%) cases in the cold season and
- 22 (6,26%) cases in the warm period.

Recurrences were present for:

- 16 (3,08%) cases in the cold season and
- 21 (5,98%) cases in the warm season.

The biological setting has been modified in different percentages as follows:

- Dystrophy in 340 (39,08%) patients
- Rachitism in 277 (31,83%) patients
- Anemia in 487 (55,97%) patients
- Pre-maturity in 14% of the cases.

Discussions:

This retrospective study shows that the individual socio-economic factors and especially those associated can have an important part in the appearance and evolution of BA. Thus, the precarious and mediocre habitat conditions can be discovered in more than 65,78% of the patients suffering from BA and 49,40% of them developed severe forms of BA with IRA.

The forms of BA with IRA in children living in a proper social environment were present in 47,13% of the cases.

Concerning the healing rate during the first 2 weeks from the debut of BA there was no registered case.

The factors of the child's ecosystem influence decisively his biological condition. Child's physical, psychological and social development is highly connected to the components of the environment in which he lives and grows.

BA, a respiratory affection with a debut and evolution often severe in babies and little children, raises many assistance problems for his pediatrician due to the evolution potential and the cautious prognosis associated with the evolution of this affection.

BA affects the babies and little children of 4-6 months up to 2-2,6 years of age, appears mostly on the cold season and has a higher frequency in the urban environment due to the dense crowd, the spread of viral infections and the general conditions of urban habitat.

Our study sample underlined the presence of 60% of the patients suffering from BA as living in the urban environment and 40% of them living in the rural one.

From the clinical form and the origin environment point of view, in our sample:

1. 49,04% of BA shows common forms
2. 50,95% severe forms in the urban environment
    1. 57,47 % common forms
    2. 42,57% severe forms in the rural environment.

Significant differences were recorded at the patients living in a mediocre habitat (67,50%) and a good habitat (65,99%), which shows that following the proper treatment after having a diagnosis at the right time can eliminate

the social handicap of the living place; but important differences can be underlined in what concerns the recurrences (6,97%) for those with precarious and mediocre habitat compared to those having proper living conditions (4,37%), as well as the frequency of relapses occurring in 8,37% of the cases with disfavored habit conditions compared to 6,39% of the cases having adequate habitat conditions.

Thus we can underline that a mediocre and improper habitat can influence the appearance and evolution of BA in children. These data will be linked to the high incidence of BA cases appeared in the urban environment (60%); 50,95% of the patients under study suffering from severe forms of BA are living in urban environment and 42,52% of the cases in the rural one.

The healing process was produced in a period of time up to 14 days in both environments: 67,81% in the urban one and 65,22% in the rural one.

Recurrences have been more frequent in the rural environment (7,18%) compared to the urban one (5,36%) due to caring and accessibility to medical services.

The season acts as a competitive factor to the social-economic one in the appearance of BA. Thus 59,65% of the cases got ill during the cold season and only 40,34% of the cases in the warm season.

The common forms of the disease have been more frequent (59,25%) during the warm season, and the severe forms of BA with IRA during the cold season (52,21%).

The curing process in a period up to two weeks occurred in 72,07% of the cases during the warm season.

In 36,80% of the cases with BA occurred in the cold season the administration of the treatment for 14 days was compulsory, compared to only 27,92% of the cases with BA in the warm season.

The modified biological background was present as a factor associated to the social-economic one (habitat, origin environment, etc.) and contributed to the appearance and evolution of BA:

- anemia was present in 55,97% of the patients with BA
- rachitismul in 31,83 % of the cases
- dystrophy in 39,08% of the cases.

These morbid conditions are the result of more social-economic, educational and familial discrepancies than genetic and organic ones.

Once appeared as diseases of social-economic origin the anemia, dystrophy and rachitism will imply the effect of other social factors involved in the appearance of BA: habit conditions, origin environment (rural/urban), families with precarious financial possibilities, uneducated mothers or having insufficient education in the field of child care, etc.

The precarious biological background will facilitate the development of acute infections, predominantly viral ones, due to unbalancing homeostasis of the specific or unspecific immunological mechanisms, favoring the development of acute infections of inferior respiratory ducts with monotonous evolution and sometimes appearing some severe clinical forms.

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