

Epidemiological, Clinical Profiles and Outcome of Bronchiolitis in Iraqi Children

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Summary:

Background:

Bronchiolitis is the first episode of wheezing associated with low-grade fever, rhinitis, tachypnea, and increase respiratory effort in a previously healthy infant during the winter months. It is the most common disease of the lower respiratory tract.

Methods:

This is a case control study carried out on one hundred infants with a mean age of 3.9 months \pm 2.2 months admitted to Children Welfare Teaching Hospital in Medical City – Baghdad with acute bronchiolitis during the period from 1st January 2006 to 1st April 2006. epidemiological risk factors, clinical presentations, chest X-ray findings, treatment, complications and outcome were analyzed. Another one hundred infants (age and sex matched) were seen in the outpatient clinical in the same period and for health problems other than bronchiolitis were taken as a control group. Chi square test was used and a $P < 0.05$ was considered significant.

Results:

It was found that 64% of patients were males and 36% were females M/F: 1.9/1, 80% were < 6 months and 20% were > 6 months of age. Most cases (87%) were admitted on January and February. Bronchiolitis was uncommon and less severe in neonatal period. There was a significant association between urban residence and acute bronchiolitis. There was no significant association between each of family history of atopy, parental smoking, pets at home and crowding index > 30 with bronchiolitis. Fever $> 38.1^{\circ}\text{C}$ was significantly more common in infants with bronchiolitis > 6 months of age than those less than 6 months.

Conclusions:

The mean clinical scores of severity, the mean duration of hospitalization and Chest X-ray findings were higher in: male sex, age < 6 months, infants who were on exclusive breast feeding. Corticosteroids did not reduce the duration of hospitalization in children with acute bronchiolitis.

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Introduction:

Acute bronchiolitis is predominantly a viral disease. RSV is responsible for more than 50% of cases. Other agents include parainfluenza virus type 3 (10-30%), adenovirus type 3, 7, 21 (5-10%), influenza virus (10-20%), mycoplasma pneumonia (3-15%), also rarely Chlamydia trachomatis, rhinovirus, enterovirus, measles virus. There is

no evidence of a bacterial cause for bronchiolitis, although bacterial pneumonia is sometimes confused clinically with bronchiolitis and bronchiolitis may be followed by bacterial super-infection (1, 2). The two primary modes of transmission for RSV include direct contact with large droplets of secretions and self-inoculation by hands mode infections by touching, contaminate objects. Bronchiolitis is characterized by virus-induced necrosis of the bronchial epithelium, hypersecretion of mucus and round cell infiltration and edema of the surrounding submucosa. These changes result in formation of mucous plugs obstructing bronchioles with consequent hyperinflation or collapse of the distal lung tissue. Reinfection with RSV

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occurs throughout life. Reinfection rates among preschool children can range from 40-70%. The annual risk of reinfection among school-age children, adolescents and adults is approximately 20%. Reinfection is usually mild. Disease in the immediate newborn period is uncommon, but nosocomial outbreak of RSV has occurred in neonatal nurseries (3). Peak rates occur in infants aged 6 weeks to 6 months, but particularly in those under 3 months of age (4). Bronchiolitis and pneumonia due to RSV are more common in boys than in girls by a ratio of approximately 1.5:1. Young male patients appear to experience more severe disease than their female counterparts. Racial factors make a little difference (2). Risk factors predisposing to serious disease include: prematurely (<37 weeks), cardiopulmonary disease, immune deficiency, metabolic disease, age less than 3 months during infection, male gender, infants who have not breast fed, passive exposure to tobacco smoke, crowding (2 or more children sleeping in the same room with the infected child), family history of atopy or asthma, low socioeconomic status, infection with the A subgroup of RSV (2, 11). Routine laboratory tests not indicated in the infant with bronchiolitis who is comfortable in room air, well-hydrated, fed adequately. The white cell count is normal or elevated, and the differential count may be normal with either a neutrophilic or mononuclear predominance. Roentgenogram, there is little likelihood of bacterial component. Chest radiographs is unhelpful in typical cases of bronchiolitis and should be avoided unless there is underlying illness or deterioration in clinical status suggesting the need for intensive care (5). Chest radiographs of infants hospitalized with RSV bronchiolitis are normal in approximately 10% of cases; air trapping or hyperexpansion of the chest is a hallmark of RSV infection and occurs in approximately 50%. Peri-bronchial thickening or interstitial pneumonia is seen in 50-80%. Segmental consolidation occurs in 10-25% particularly in younger infants and most commonly in the right upper or middle lobe. Consolidation without other signs or with pleural effusion is considered of bacterial origin until proved otherwise. Other signs suggesting bacterial pneumonia. Decisions about ribavirin administration should be made on the basis of the particular clinical circumstances and physicians' experience (6).

There is no convincing evidence of a positive impact on clinically important outcomes such as mortality and duration of hospitalization (1). Randomized clinical trials of bronchodilators including oral and inhaled beta-2-agonists, combined alpha- and beta-agonists and anticholinergics have yielded variable results. Because not all children with bronchiolitis have bronchospasm, it is logical to expect that bronchodilators may not have efficacy across the population of patients with bronchiolitis (2). Although corticosteroids are widely used, clinical studies have not shown clear evidence of efficacy in reducing symptoms or shortening hospitalization (2, 4). Some studies suggested that disease severity and timing of therapy might correlate with the benefits of corticosteroids therapy. Therefore, it may be useful to target infants with severe disease when utilizing corticosteroids therapy. In infants and children with BPO and asthma, steroids are useful, because of the underlying reactive airway disease (2).

Patients and Methods:

This case control study was done in Children Welfare Teaching Hospital – Medical City – Baghdad during the period from the 1st January 2006 to the 1st April 2006. One hundred previously healthy infants less than one year of age with the first attack of wheeze were included and one hundred infants (age and sex matched) with health problems other than acute bronchiolitis seen in the outpatient clinic were taken as a control group and variables were compared. Acute bronchiolitis was defined as the first episode of wheezing associated with low-grade fever, rhinitis, and tachypnea and increase respiratory effort in a previously healthy infant during the winter months (2). The following points were included in the history and examination of each patient with acute bronchiolitis: age, sex, residence, family history of atopy, family history of smoking, pets at home, history and duration of URTI before dyspnea, history and duration of dyspnea before admission, type of feeding, crowding index (no. of persons / no. of rooms), feeding intolerance, cough, cyanosis, dyspnea, wheeze, rales, temperature, respiratory rate, heart rate, CXR findings, types of treatment, complications, duration of hospitalization, and outcome. From the control group, the following points were included: Age, sex, residence, crowding index, family

history of atopy, family history of smoking, and pets at home. Chest x-rays supplied with reports were performed to all studied patients. Those with history underlying cardiopulmonary diseases were excluded from the study. A clinical score was assigned based on modified Down's score, one score for each of the following: Respiratory rate > 60/min, respiratory rate > 80/min, cyanosis, severe retraction, coarse rales, pulmonary infiltrate on chest x-ray, hospitalization > 3 days, hospitalization > 5 days. A total score was 8 (7). Statistical analysis was done using SPSS version 13 software program, Chi square test was used and a P value < 0.05 was considered insignificant.

Results:

The age range of infants with bronchiolitis was 20 days – 11 months, the mean age was 3.9 ± 2.2 months. Three neonates were included and 80% of cases were under 6 months of age, (64%) cases were males and (36%) were females with male to female ratio of 1.9:1, (60%) were from urban and 40% were from rural areas, (47%) cases were admitted on January, 40% on February and 13% on March, 40% were on exclusive breast feeding (85% of the were < 6 months), 41% were on bottle feeding, 19% were on mixed feeding. History of URTI was recorded in all infants with bronchiolitis. The mean duration of URTI before dyspnea was 4.5 ± 1.8 days and the mean duration of dyspnea before admission was 1.8 ± 1.2 days. Family history of atopy was positive in 37% of cases (bronchial asthma 62%, allergic rhinitis 22%, atopic dermatitis 16%), while it was positive in 28% of controls (Bronchial asthma 64%, allergic rhinitis 28%, atopic dermatitis 8%). The presence of Pets at home was positive in 19% in cases and 15% in controls. Smoking at home was positive in 67% of cases and 62% in controls, as shown in table -1-. There is a significant association between urban residence with acute bronchiolitis. Feeding intolerance was recorded in 29 (32.2%) cases under 6 months and in 50% of cases over 6 months. Nasogastric feeding was used in 18 patients under 6 months and in 2 patients over 6 months. Tachypnea (RR 60-80/min) was present in 29(36.2%) in those under 6 months and 8(40%) in those over 6 months, while RR > 80/min was present in 3(37%) in those under 6 months and in 1(5%) in those over 6 months.

Fever ($37.5-38^{\circ}\text{C}$) was present in 15 (18.7%) in those under 6 months and in 5(25%) in those over 6 months; while fever ($38.1-39.5^{\circ}\text{C}$) was present in 8(10%) in those under 6 months and in 6 (30%) in those over 6 months. There is a significant association between temperature more than 38°C and age over 6 months in infants with acute bronchiolitis. Moderate chest retraction was present in 40(50%) in those under 6 months and in 8(35%) in those over 6 months, while severe chest retraction was present in 16(20%) in those under 6 months and in 7(15%) in those over 6 months. Cyanosis was present in 16(20%) in those under 6 months and in 3(15%) in those over 6 months. Crepitation was present in 53(66.2%) in those under 6 months and in 11(55%) in those over 6 months. There is significant association between fever ($>38^{\circ}\text{C}$) and infants > 6 months as shown in table -2-. The mean clinical scores of severity of acute bronchiolitis is higher in infants < 6 months of age than infants > 6 months-aged groups, in those who were exclusive breast fed than those who were non-breast fed, in males than females. Neonates had the lowest scores as shown in table -3-. Infants who were breast fed had higher scores of severity than infants who were non-breast fed as shown in table -4-. Chest X-rays were done to all cases, air trapping was found in 69(86.2%) of those under 6 months and in 13(65%) of those over 6 months. Consolidation was found in 63(78.8%) of those under 6 months and in 10(50%) of those over 6 months. Lung collapse, pneumothorax each found in only one of those less than 6 months, but not found in those over 6 months. So, CXR findings (air trapping, consolidation) were significantly higher in those under 6 months with bronchiolitis than those over 6 months as shown in table -5-. Salbutamol nebulizer was supplied to all infants. Corticosteroids were used in 63%, antibiotics were used in 98%, and intravenous fluid was used in 55% of patients. As regard complications: 3 patients had pneumonia, 1 patient had pneumothorax, and 2 patients had respiratory failure. Only 2 patients admitted to the respiratory intensive care unit and put on mechanical ventilation. The mean duration of hospitalization of infants with bronchiolitis was 6.7 days (ranging between 1-3 days). The Mean duration of hospitalization for those under 6 months was higher than in those over

6 months (7 days versus 5.3 days), higher in males than females (6.9 days versus 6.3 days), higher in those who were on breast feeding than those who were on non-breast feeding (7 days versus 6.4 days), higher in those with family history of atopy than those with no family history of atopy (6.9 days versus 6.3 days), and similar between those who did not receive steroids and those who received steroids (6.8 days), 98% of our patients discharged well, only 2 patients (2%) died due to respiratory failure.

Table 1: Risk factors in 100 infants with acute bronchiolitis and control infants

Risk Factors		Cases	Controls	P. value
Family history of Atopy		37	28	>0.25
Smoking		67	62	>0.5
Residence	Rural	40	20	< 0.005*
	Urban	60	80	
Crowding index > 3		38	56	< 0.025
Pets at home		19	15	>0.25

* P value is significant.

Table 2: Symptoms and signs in 100 infants with acute bronchiolitis aged less than 6 months and more than 6 months.

Clinical Features	Under 6 months No=80		Over 6 months No=20		P Value	
	No.	%	No.	%		
History of URTI	80	100	20	100		
Cough	80	100	20	100		
Feeding intolerance	29	36.2	10	50	<0.5	
Fever	37.5-38 ⁰ C	15	18.7	5	25	>0.5
	38.1-39.5 ⁰ C	8	10	6	30	<0.025*
Tachypnea	RR 60-80/min	29	36.2	8	40	>0.5
	RR>80/min	3	3.7	1	5	>0.5
Chest retractions**	Moderate	40	50	8	35	<0.5
	Severe	16	20	7	15	<0.25
Cyanosis	16	20	3	15	<0.25	
Crepitation	53	66.2	11	55	<0.5	

* P value is significant

** Moderate chest retraction = intercostals and subcostal recessions.

Severe chest retraction = intercostals, subcostal, and suprasternal recessions.

Table 3: The mean clinical scores of 100 infants with acute bronchiolitis

Variable	No.	Mean	SD	P value
Males	64	4.031	1.45	>0.05
Females	36	3.611	1.02	
Neonates	2	3.5	7.07	
Younger than 6 mo.	77	3.922	1.34	>0.05
Older than 6 mo.	20	3.72	1.25	
Exclusively breast fed	39	4.256	1.21	>0.05
Exclusively bottle fed	39	3.546	1.50	
On mixed feeding	20	3.55	1.91	

Table 4: Clinical scoring of 100 infants with acute bronchiolitis according to the type of feeding

Score	Exclusive breast feeding		Non breast feeding		P Value
	No.	%	No.	%	
≤3	10	25	21	51.3	<0.025*
>3	30	75	20	48.7	
Total	40	100	41	100	

* P value is significant.

** 19 Patients were on mixed feeding.

Table 5: The prevalence of radiological findings in infants with bronchiolitis under and over 6 months of age

Radiological Findings	Under 6 months No=80		Over 6 months No=20		P value
Air trapping	69	86.2	13	65	<0.05*
Consolidation	63	78.7	10	50	<0.01**
Collapse	1	1.2	0	0	
Pneumothorax	1	1.2	0	0	

* P value is significant.

Discussion:

This study was done when there was an epidemic of bronchiolitis in winter months in Iraq. Bronchiolitis is a common disease in infants and it is responsible for a large number of hospitalizations during winter and spring.

The mean age was 3.9±2.2 months. Nazar et al (8) had found a mean age of 5 months in Mosul. Bronchiolitis is usually uncommon in neonatal period. The illness may be mild or atypical and this may be attributed to the protective effect of maternal antibodies (9). In this study, only 3% of all patients studied were neonates. The sex distribution was 64% males,

36% females (male to female ratio was 1.8:1). This is in agreement with Cabrera et al (10) who found a ratio of 1.7:1 in Spain. Male patients with acute bronchiolitis are admitted to hospitals more than females and it is suggested that males had more severe illness than females (4).

Sixty (60%) cases were from urban and 40% were from rural areas. There is a significant association between urban residence with acute bronchiolitis, and this may be due to greater opportunities for spread of viruses in urban areas due to overcrowding (10). Nevertheless, overcrowding did not show significant effect in the present study. Family history of atopy was present in 37% of cases and in 28% of controls. Sims et al (11) found family history of atopy in 50% of infants with bronchiolitis, while Pullan et al (12) found it in 11% of patients.

The mean clinical scores of severity were higher in those who were breast fed. This might be due to the fact that the majority (85%) of them were < 6 months, and this age group had more complications than those over 6 months because of smaller airways. This is in agreement with Rubin et al (13) who found that breast feeding does not provide substantial protection against a common infectious illness during the first year of life, but this is in disagreement with Wright et al (14) who found that breast feeding seems to protect against wheezing respiratory tract illness in the first 4 months of life. Nazar et al (8) found that the mean clinical scores were not significantly differed between those under 6 months and those over 6 months and between males and females, but was higher in those who were on non-breast feeding than those who were on breast feeding). Oxygen was given to most patients in this study. Intravenous fluid was given to 55% of patients, antibiotics were given to 98% of patients, corticosteroids were given to 63% (mainly intravenous

dexamethasone), salbutamol nebulizer to all patients, other bronchodilators like theophylline, adrenalin, ipratropium bromide were not given to any patient. Only 2 infants needed mechanical ventilation. The clinical scores of severity and mean duration of hospitalization were similar between those used steroids and those not used steroids. This result is in agreement with the result of De Boek et al (15) and Roosevelt et al (16) which showed that neither intravenous dexamethasone against placebo had differences between the study groups for outcomes such as duration of hospitalization or time to resolution of clinical symptoms, but this is in disagreement with Garrison et al (17) who performed a meta-analysis of randomized, placebo-controlled trials of systemic corticosteroids and extracted data for length of stay, duration of symptoms and clinical scores for hospitalized infants with mild to moderate disease. The mean duration of hospitalization of infants with bronchiolitis in our study was 6.7 days (ranging between 1-30 days) and the mean duration of hospitalization for those under 6 months was 7 days while 5.3 days for those over 6 months. These results are in disagreement with Al-Janabi M (18) study who found that the mean duration of hospitalization was 3.2 days (ranging between 1-8 days) and with Nazar et al (8) who found that the mean duration of hospitalization in those under 6 months was 3.3 days and 2.8 days for those over 6 months. Most of the patients (98%) discharged well, only 2 patients (2%) were died due to respiratory failure. This study concluded that bronchiolitis is uncommon and less severe in neonatal period, the mean clinical scores of severity, the mean duration of hospitalization were higher in: male sex, age < 6 months, infants who were on exclusive breast feeding and corticosteroids did not reduce the duration of hospitalization in acute bronchiolitis.

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