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Clinical and Epidemiological Characteristics Associated with the Severity of Bronchiolitis in Hospitalized Children in Iraq

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ABSTRACT

Background: Bronchiolitis is the most common acute infection of infants' lower respiratory tract especially in the first two years of age. Its clinical course is complex where symptoms vary in severity and may progress rapidly to respiratory failure. Some factors can predispose to severe bronchiolitis like inhalation of cigarette smoke, crowded living environment, congenital heart defects and lack of breastfeeding. **Aim of the study:** The study aims to study the clinical and sociodemographic factors that are related to the severity of acute bronchiolitis in the patients included in the study. **Patients and Methods**: A cross-sectional study achieved at Hevi pediatric teaching Children Hospital in Duhok north of Iraq in the period from 1st November 2022 to 1st February 2023. The study included all patients aged 1-24 months diagnosed to have bronchiolitis and treated as inpatient in the hospital during that period. The diagnosis was made according to the American Academy of Pediatrics (AAP) diagnostic criteria in 2014. The severity of bronchiolitis was classified according to the Modified Cincinnati Bronchiolitis Score (MCBS). For every participant, the clinical aspects and epidemiological factors associated with bronchiolitis were obtained through a questionnaire filled by direct interview with parents. The data were analyzed by using Statistical Package for Social Sciences (SPSS) software version 26; the clinical significance was considered when P value is less than 0.05. **Results:** The study included 148 patients with bronchiolitis. Most of them were of moderate severity and female were more common. The age group (3-6 months) was significantly associated with severity. Most of patients lived in urban areas and were delivered by Caesarean section. Exposure to tobacco smoke was significantly associated with the severity of the disease. The artificial feeding was the most common with significant association with the severity. Most of patients had siblings attending school and childcare without significant association with the severity and less than a quarter of them had a family history of asthma. Poor living conditions was significantly associated with severity. Local cradle (landik) was significantly associated with severity. Most chest X ray findings were normal in 126 patients (85.1%) with no significant association with severity. **Conclusion:** Age, exposure to tobacco smoke, type of feeding, poor living conditions and sleeping in the local cradle (landik) were significantly related to the bronchiolitis severity in Duhok.

Keywords: Bronchiolitis, Feeding, Infant, Severity, Smoke.

Article Information

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INTRUDUCTION

Bronchiolitis is the most common acute lower respiratory tract infection of infancy [(1,2)]. Yearly 150 million infants are diagnosed with bronchiolitis over the world, and 2–3% of them are hospitalized. There is evidence that bronchiolitis brings about wheezing bronchitis and bronchial asthma in the future [(3)]. Bronchiolitis results in increased expenditure both to families and healthcare systems [(4,5)]. Acute respiratory distress syndrome leads 2-3% of the pediatric patients to hospital admission

and 5% of them to intensive care units' admission. Severe bronchiolitis causes a mortality of 1-7% and is responsible for 30-40% of bronchopulmonary dysplasia in children, congenital heart defects, and preterm birth. Pediatric patients should have an early diagnosis and prompt treatment to minimize mortality [6].

When reaching the age of two years, most of children will have had at least one attack of bronchiolitis [7]. Some factors can predispose to severe bronchiolitis with longer hospitalization time and higher death rate like inhalation of cigarette smoke, crowded living environment, congenital heart defects and lack of breastfeeding [8].

To the best of the researcher's knowledge, lack of studies has been identified in the area in dealing with bronchiolitis despite its being a very common health problem. Knowing epidemiological factors, clinical findings and the risk factors of bronchiolitis are important aspects that help identify severe cases of bronchiolitis as an everyday practice clinical syndrome.

PATIENTS AND METHODS

A descriptive cross-sectional study was carried out at Hevi Pediatric Teaching Hospital in Duhok north of Iraq in the period from 1st November 2022 to 1st February 2023. Ethical approval for this study was obtained from the Council of Medical Ethics of the General Directorate of Health of Duhok, and an informed consent was also obtained from parents. The study has included all patients with age 1-24 months diagnosed to have bronchiolitis and admitted to the hospital during that period. The diagnosis of bronchiolitis was made according to the diagnostic criteria of the American Academy of Pediatrics (AAP) in 2014 , as follows[9]:

1. Upper respiratory tract inflammation: cough, fever, rhinorrhea and sneezing
2. Progression to chest indentation, tachypnea or intercostal muscle pull within 48 to 72 hours. Air stasis signs of were probably detected in chest X-ray or clinical examination
3. First or second attack of wheezing
4. Lung examination: crackles, hissing or rhonchi heard mainly during exhalation. There may be decreased vesicular murmur or no heard rale

Diagnosing the bronchiolitis severity of depended on the Modified Cincinnati Bronchiolitis Score (MCBS) [6], Table 1. For every participant, the clinical aspects and epidemiological factors associated with bronchiolitis were obtained through a questionnaire filled by direct interview with parents.

The Study Design

It is a cross-sectional study.

Subjects

The study included 148 patients with bronchiolitis. Thirty-three (22.29%) had mild disease, 65 (43.91%) had a moderate disease and 50 (33.78%) had a severe disease.

Exclusion criteria

Children were to be excluded from the study if they have more than two attacks wheezing, were diagnosed to have bronchial asthma, if their ages were beyond the ages specified in this study, or the parents refused participation in the study.

STATISTICAL ANALYSIS

The data were analyzed by using the Statistical Package for Social Sciences (SPSS) software version 26. The association between categorical variables was analyzed by using Pearson's chi-square test. The data were presented as mean ± standard error of the mean Significance was considered when P value is less than 0.05.

RESULTS

The study included 148 patients with bronchiolitis. Thirty-three (22.29%) had mild disease, 65 (43.91%) had a moderate disease and 50 (33.78%) had a severe disease. As shown in Table 2, females were more common with no significant association with the severity. The largest age group was 3-6 months, with significant association with the severity. Their residence was most commonly in urban areas 84(56.8%). Only 8(5.4%) of the patients had a past medical history. Caesarean section was the most common mode of delivery but without any significant association with the severity of the disease. Exposure to tobacco smoke was significantly associated with the severity of the disease. The artificial feeding was the most common with significant association with the severity. Ninety (68.8%) had siblings attending school and child care without significant association with the severity. Thirty-four (23%) had a family history of asthma. Poor living conditions were significantly associated with severity. Local cradle (landik) was significantly associated with severity. Most chest X ray findings were normal in 126 patients (85.1%) with no significant association with severity.

Table 1: The Modified Cincinnati Bronchiolitis Score (MCBS).

Factors	0	1	2
Respiratory rate	Normal	>50/minute when not crying or agitated	
Muscles	Normal	Moderate retractions	Severe retraction
Air exchange	Normal	Localized decreased	Multi area decreased
Wheezes	None/End expiratory	Entire expiratory	Entire expiration and inhalation
Evaluation: Mild: 0-2 points; Moderate: 3-5 points; Severe: 6-7 points			

Table 2: Clinical, epidemiological and associated factors of bronchiolitis

Variables	**Mild No.(%)**	**Moderate No.(%)**	**Severe No.(%)**	**Total No.(%)**	**X^2**	**df**	**P-Value**
Age group							
> 3	9(27.3)	17(26.2)	13(26)	39(26.4)	11	6	0.04
3 to < 6 months	8(24.2)	16(24.6)	19(38)	43(29.1)			
6 to < 12 months	6(18.2)	15(23.1)	15(30)	36(24.3)			
1 to 2 years	10(30.3)	17(26.2)	3(6)	30(20.3)			
Gender							
Male	16(48.5)	32(49.2)	25(50)	73(49.3)	0.01	2	0
Female	17(51.5)	33(50.8)	25(50)	75(50.7)			9

Residency							
City	18(54.5)	39(60)	27(54)	84(56.8)	1.75	4	0.7
Rural	13(39.4)	19(29.2)	19(38)	51(34.5)			
Camp	2(6.1)	7(10.8)	4(8)	13(8.8)			
History of a previous attack							
YES	1(3)	3(4.6)	4(8)	8(5.4)	1.1	2	0.5
NO	32(97)	62(95.4)	46(92)	140(94.6)			
Mode of delivery							
VD	14(42.4)	26(40)	13(26)	53(35.8)	3.2	2	0.2
CS	19(57.6)	39(60)	37(74)	95(64.2)			
Premature birth							
YES	2(6.1)	8(12.3)	10(20)	20(13.5)	3.4	2	0.1
NO	31(93.9)	57(87.7)	40(80)	128(86.5)			
Chrinic heart or lung disease							
YES	0(0)	0(0)	2(4)	2(1.4)	3.9	2	0.1
NO	33(100)	65(100)	48(96)	146(98.6)			
Depressed immune system							
YES	0(0)	0(0)	1(2)	1(0.7)	1.9	2	0.3
NO	33(100)	65(100)	49(98)	147(99.3)			
Exposure to tobacco smoke							
YES	9(27.3)	32(49.2)	34(68)	75(50.7)	13.2	2	0.001
NO	24(72.7)	33(50.8)	16(32)	73(49.3)			
Feeding types							
Breast feeding	12(36.4)	21(32.3)	1(2)	34(23)	24	4	0.001
Artificial feeding	7(21.2)	25(38.5)	31(62)	63(42.6)			
Mixed	14(42.4)	19(29.2)	18(36)	51(34.5)			
Having siblings who attended School or daycare							
YES	16(48.5)	24(36.9)	18(36)	58(39.2)	1.5	2	0.4
NO	17(51.5)	41(63.1)	32(64)	90(60.8)			
Family History of Asthma							
YES	7(21.2)	18(27.7)	9(18)	34(23)	1.5	2	0.4
NO	26(78.8)	47(72.3)	41(82)	114(77)			
Poor living condition							
YES	12(36.4)	30(46.2)	36(72)	78(52.7)	12.1	2	0.002
NO	21(63.6)	35(53.8)	14(28)	70(47.3)			
Maternal education							

Illiterate	24(72.7)	41(63.1)	35(70)	100(67.6)	5.7	4	0.2
Primary & secondary school	3(9.1)	18(27.7)	9(18)	30(20.3)			
College & institute	6 (18.2)	6(9.2)	6(12)	18(12.2)			
Sleeping in local cradle (Landik)							
YES	24(72.7)	56(86.2)	47(94)	127(85.8)	7.4	2	0.02
NO	9(27.3)	9(13.8)	3(6)	21(14.2)			
X Ray details							
Irrelevant	28(84.8)	57(87.7)	41(82)	126(85.1)	2.3	4	0.6
Hyperinflation	5(15.2)	8(12.3)	8(16)	21(14.2)			
Collapse	0(0)	0(0)	1(2)	1(0.7)			
Total	33(100)	65(100)	50(100)	148(100)			

DISCUSSION

In this study, females were more common than males (50.7 vs 49.3). This result is in contrast to other studies that showed that males were more commonly affected at 69.2% 10; 63%14, male to female ratio of 1.42:115. The age of patients in this study shows that infants at age of less than 6 months are the most prevalent (55.5%) which is similar to what was found in another study: 57% were younger than six months [6]. There is a significant association between age and severity of bronchiolitis since the underdeveloped immune system at younger age and narrower caliber of bronchioles make them more likely to get infected and have a severe course of disease [10,11]. This is in line with other studies that found similar results [6,12,13].

Among the factors compared between severe and mild and moderate cases of bronchiolitis, exposure to tobacco smoke was significantly associated with severity of bronchiolitis. Similar results were also found by other studies [6,14-20]. This is because of the irritant effect of inhaled smoke on the respiratory tract epithelium. The present study revealed that the type of feeding is strongly associated with severity of bronchiolitis. Various immunologic factors present in breast milk exert a protective role against infections including bronchiolitis. This goes in line with studies done in different parts of the world [6,19-21]. Poor living conditions, especially living in an overcrowded house, are significantly associated with bronchiolitis severity in this study. This is in line with other studies that found that poor living conditions are related significantly to bronchiolitis severity [6,11,15,19,20]. This is because as the number of household members increases, the risk of exposure to respiratory secretions increases [13]. Sleeping in the local cradle (landik), where the infant is swaddled and tied to the cradle at a fixed supine posture, is significantly associated with severity of bronchiolitis. A study by Baudin et al showed that prone positioning in sleep for infants with bronchiolitis has a beneficial effect through decreasing respiratory effort and the metabolic cost of breathing [22].

In the current study, gender was not found to be associated significantly with severity of bronchiolitis in line with another study [6] but this in contrast to other studies that found a significant association [8,23]. Though living in urban areas was more common among infants with bronchiolitis, no significant association with severity was proved in this study. Air pollution in urban areas was found to a risk factor for bronchiolitis in other studies [19,20]. Delivery by Caesarean section was the most

common mode of delivery in most of the infants included in this study but no significant association was found with severity of presentation although it is known that delivery by Caesarean section impairs immunity thus increasing the risk of infection [6,11,24].

History of premature delivery was not found as a significantly associated factor with bronchiolitis severity in this study in contrast to other studies that found such a significant association [6,10,20,25,26]. This can be explained by smaller airway and suboptimal immune response in premature [26].

Chronic heart diseases were infrequent and not associated with severity of bronchiolitis. Different other studies found this a very significant associate with bronchiolitis severity [20,25]. The increased lung stiffness and hypoxemia associated with heart diseases intensifies the narrowing of airway and severity of presentation of bronchiolitis. Though having siblings attending school or day care is expected to an important way through which bronchiolitis is acquired by infants, the present study did not find a significant association with the severity of bronchiolitis in contradiction to other studies that found it significant [6,19].

Almost a quarter of the patients had a family history of asthma but this was not significantly associated, on the contrary to a study that found history of asthma in the mother a significant factor associated with severity of bronchiolitis [24]. The maternal education is not significantly associated with bronchiolitis severity in the current study although other studies found it significant [6].

CONCLUSIONS

This study shows that age, exposure to tobacco smoke, type of feeding, poor living conditions and sleeping in the local cradle (landik) were related significantly to severity of bronchiolitis in Duhok.

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