

Risk Factors and Severity of Bronchiolitis during Infancy, An Observational Study

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ABSTRACT

Background: Bronchiolitis is a common disease of lower respiratory tract infection in infants, resulting from inflammatory obstruction of the small airways.

Objectives: To study the risk factors associated with bronchiolitis and to assess the severity of bronchiolitis in infants regarding symptoms, signs, and clinical presentation.

Materials and Methods: This study carried out on two hundred infants with acute bronchiolitis during the period from 1st of November 2019 to the 1st of March 2020.

Results: (61%) of the patients were males and (39%) were females, the peak age was 6 months, (37.5 % were less than 6 months, (60 %) came from urban areas and (40%) came from rural areas. Family history of second wheeze for patients was (n=53,26.5%), for overcrowding it was (n=129,64.5%), low socio-economic status shows in (n=75,37.5%), regarding family history of smoking it was (n=146,73%) and male gender shows in (n=122,61%). Fever is more common among patients older than 6 months of age while respiratory rate and irritability were more common in infants younger than 6 months of age.

Conclusion: There is an association with urban residence, overcrowding, family history of smoking, low socio-economic status and male gender. The study shows that there is a protective effect of breast feeding against bronchiolitis. There was no difference of radiological findings between infants under and over 6 months of age.

Keywords: Bronchiolitis, pediatrics, risk factors.

INTRODUCTION

Acute bronchiolitis, a viral infection of the lower respiratory tract, worldwide it is one of the most substantial health burdens for infants and young children[1]. It refers to airway inflammation and obstruction of the lower respiratory tract and is caused almost exclusively by viral infection in children younger than 2 years[2].

Bronchiolitis is a seasonal infection[3]. In regions with temperate climates, Respiratory syncytial virus (RSV) causes epidemics in the winter[4].

According to the World Health Organization bulletin, an estimated 150 million new cases occur annually; 11-20 million (7-13%) of these cases are severe enough to require hospital admission. Worldwide, 95% of all cases occur in developing countries[5]. Respiratory syncytial virus represents a public health issue in many countries[6]. Chronologic age is the single most important determinant for severe bronchiolitis and the peak incidence of severe disease occurs in infants less than 6 months of age, and the highest rates of hospitalization occur among infants between 60 and 90 days of age[7].

Other viruses implicated in the etiology of bronchiolitis include human metapneumovirus (hMPV), parainfluenza virus (PIV), influenza virus A and B virus (InfV), human rhinovirus (HRV), human coronavirus (HCoV), adenovirus (AdV), enterovirus (EV) and human bocavirus (HBoV) [8].

The pathogenesis of bronchiolitis involves a combination of airway edema, increased mucus production, and necrosis of airway epithelial cells due to direct cytotoxic injury[2].

Commonly, symptoms of bronchiolitis begin with rhinitis or congestion and cough and may develop into symptoms of increasing respiratory distress (tachypnea, wheezing, and accessory muscle use). Severity of bronchiolitis can vary from mild symptoms that can be managed at home to acute respiratory failure requiring invasive ventilation[2].

Certain comorbidities associated with bronchiolitis, including prematurity (<29 weeks' gestation), chronic lung disease of prematurity, and hemodynamically significant congenital heart disease, may result in more severe disease compared with children without these comorbidities. Other reported risk factors for bronchiolitis include poverty, malnutrition, maternal smoking during pregnancy, congenital malformation of the airways, neuromuscular impairment, household crowding, childcare attendance, size of the childcare facility, lower level of maternal education, and living at an increased altitude[9]. There is no specific therapy for acute bronchitis. The disease is self limited, and antibiotics do not have a role in bronchiolitis improvement[10].

MATERIALS AND METHODS

This is an observational cohort study in which two hundred patients with bronchiolitis who attend Al- Al-qayara general hospital and Al-qayara primary health center in Mosul city/Iraq was studied during the period from the 1st of November 2019 to the 1st of March 2020.

The babies who were enrolled in this study were having their first attack of wheezy chest and their age was less than one year . They were 122 males (61%) and 78 females (39%) .

The criteria for the diagnosis of bronchiolitis was tachypnea, cough and wheeze. The babies with atopy and congenital heart disease were excluded from this study.

Information were taken from their mothers including age ,sex , gestational age , residence , feeding type, socioeconomic status, family history of atopy , parental smoking , number of persons per room , presence of concomitant respiratory infection in the family, vaccination, the presenting features (fever, cough, shortness of breath , cyanosis, tachypnea , apnoea , poor feeding and irritability) . The informed consent was taken from every mother.

All the babies were examined carefully concentrating on the respiratory system looking for the signs of bronchiolitis (respiratory distress ,hyperinflation , retractions , fine crepitations , wheeze , etc). Other two hundred healthy babies attending the vaccination room of the hospital were taken as a control group for comparison regarding the risk factors for bronchiolitis and they were age and gender matched. Information regarding age, gender, residence, etc for control group as well. Both patients and control were vaccinated according to the WHO schedule in Iraq .

The results were analyzed using chi square method where the p-value less than 0.05 is significant, less than 0.001 is highly significant.

RESULTS

Table (1) show that the peak age was (6.18) months.

Table (1) distribution of infants with bronchiolitis according to age and sex

Age (month)	Total No.	Male		Female	
		No.	%	No.	%
<1	9	5	4.1	4	5.1
2	12	7	5.7	5	6.4
3	15	9	7.4	6	7.7

4	18	10	8.2	8	10.2
5	22	14	11.5	8	10.2
6	48	29	23.8	19	24.6
7	20	11	9.0	9	11.5
8	16	10	8.2	6	7.7
9	12	8	6.6	4	5.1
10	11	7	5.7	4	5.1
11	9	6	4.9	3	3.8
12	8	6	4.9	2	2.6
Total	200	122	100	78	100

As shown in Fig. 1, Males were 122 (61%), females were 78 (39%) and the male to female ratio was (1.6/1).

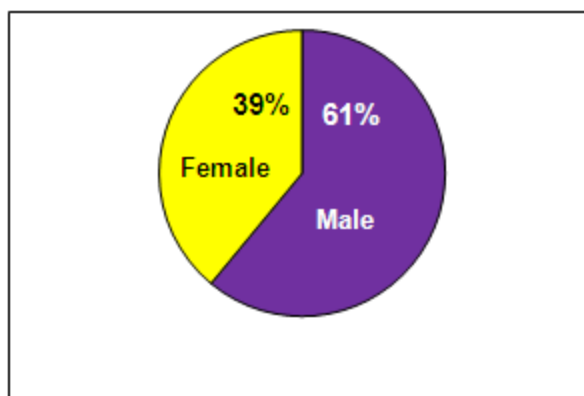


Figure (1) Gender distribution

Area of residence:

As shown in Fig. 2 , 120 Patients (60 %) came from urban areas, and 80 patients (40%) came from rural areas .

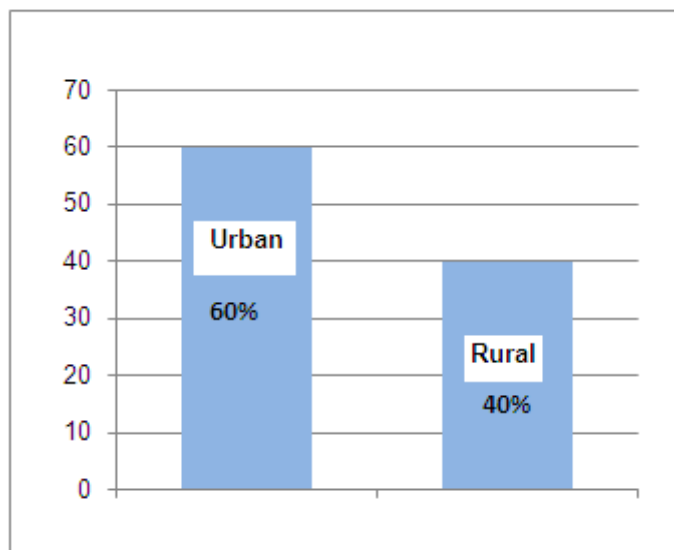


Figure (2) Residence of infants with bronchiolitis

Risk factors and feeding types:

Table (2) the risk factors and the feeding types in infants with bronchiolitis and control infants.

Risk factor	Bronchiolitis (n=200)		Control (n=200)		p-value
	No.	%	No.	%	
Family history of 2 nd wheeze	53	26.5	70	35.0	0.17
Over crowding	129	64.5	90	45.0	< 0.05
Low socio-economic status	75	37.5	30	15.0	< 0.001
Family history of smoking	146	73.0	110	55.0	< 0.05
Male sex	122	61	86	43.0	< 0.05
Type of feeding					
Exclusive breast feeding	65	32.5	100	50.0	< 0.05
Formula feeding	63	31.5	48	24.0	0.38
Mixed feeding	72	36.0	52	26.0	0.17

Family history of second wheeze for patients was (n=53,26.5%) and that for control was (n=70,35%) which is not significant (p-value=0.17).

For overcrowding it was (n=129,64.5%) and (n=90,45%) for both patient and control, respectively which is significant (p-value=< 0.05).

Low socio-economic status shows in (n=75,37.5%) for patients and (n=30,15%) for control which is significant (p-value=< 0.001).

Regarding family history of smoking it was (n=146,73%) and (n=110,55%) for both patients and control, respectively which is significant (p-value=< 0.05).

Male gender shows in (n=122,61%) and that for control were (n=86,43%) which is significant (p-value=< 0.05).

Regarding type of feeding, (n=65,32%) of patients and (n=100,50%) of control were exclusively breast fed and (n=63,31.5%) of patients were formula feeding while for control it was (n=48,24%). For, (n=72,36%) of patients and (n=52,26%) for control were mixed feeding, this demonstrates that the protective effect of breast feeding was found to be significant.

Symptoms and physical findings

Cough, upper respiratory tract infection, shortness of breath and poor feeding of those less than 6 months of age were seen in (88%,77.3%,81.3%,36%) respectively, and for older than 6 months of age,

it was seen in (91.2%,68%,76%,33.6%) respectively as seen in table (3).

The respiratory rate was higher in patients younger than six months of age than patients older than six months of age. Fever is more common in patients younger than six months of age except for moderate fever(38.1–39°C), for<38°C (41.3%) and in ≥ 6 months (30.4%) , for >39°C (28%) and in ≥ 6 months (17.6%) while for 38.1-39°C(30.7%) and in ≥ 6 months (52%).

Fine rales was seen in (80%) of younger than six months of age and in (74.4%) of ≥ 6 months.

Irritability was seen in (61.3%) of <6 months months of age and in (32.8%) of ≥ 6 months.

Regarding Severe retraction, it is noticed in (32%) of <6 months months of age and in (31.2%) of ≥ 6 months. Cyanosis was seen in (26.7%) of <6 months months of age and in (16.8%) of ≥ 6 months.

Table (3) the symptoms and the physical findings in infants with bronchiolitis

Symptoms		<6 months (n=75)		≥ 6 months (n=125)	
		No.	%	No.	%
Cough		66	88.0	114	91.2
U.R.I.		58	77.3	85	68
S.O.B.		61	81.3	95	76.0
Poor feeding		275	36	42	33.6
Physical findings					
Respiratory rate (breath per minute)	<60	12	16.0	33	26.4
	60-80	46	61.3	48	38.4
	>80	17	22.7	44	35.2
Temperature °C	<38	31	41.3	38	30.4
	38.1-39	23	30.7	65	52.0
	>39	21	28.0	22	17.6
Fine rales		60	80.0	93	74.4
Irritability		46	61.3	41	32.8
Severe retraction		24	32.0	39	31.2
Cyanosis		20	26.7	21	16.8

Table (4) shows that there was no difference of radiological findings between infants with bronchiolitis under and over 6 months of age.

Hyperinflation was the most common radiological findings in infants <6months of age (45.3%), and in (39.2%) for infants older than 6 months of age.

Table (4) The in infants with bronchiolitis

Radiological findings	<6 months (n=75)		≥ 6months (n=125)	
	No.	%	No.	%
Hyperinflation	34	45.3	49	39.2
Interstitial pneumonia	12	16	26	20.8
Collapse	2	2.6	4	3.2
Normal	21	28.0	38	30.4

DISCUSSION

Bronchiolitis typically affects children younger than two years of age, in our study the peak age for acute bronchiolitis was 6 months, this finding is similar to that found by Muddather A. et al(6 months) [11] and by Hamid, F. (6.6 months) [12].

Male to female ratio was (1.6:1) and this agree with Muddather A. et al study who found the ratio is (1.7:1). [11]

Bronchiolitis is more common in urban areas (60%) than in rural areas (40 %), there is a significant association between bronchiolitis and urban residence, Qadori study [13] found that (68.8%) of the cases of bronchiolitis were seen in urban areas and (27.3%) in rural areas This may be related to air pollution and over-crowded population which may predispose to respiratory disease.

The disease is more common in low socioeconomic status families ,this is similar to Hamid, F. [12] and Qadori [13].

Family history of second wheeze was almost similar in patients and control which is similar to that found by Qadori [13].

Children exposed to smoking are more likely to suffer from decreased lung function [14]. Smoking in the family was highly significant in infants with bronchiolitis which was seen in (73%) than in control infants (55%) , this is similar to Robledo-Aceves M study which found that in (64.2%) of patients and (45.5%) of control [15]. So it is important to inform parents of the risks associated with smoking exposure and encourage them to avoid such a practice.

Overcrowding (more than two persons per room) has significant impact with bronchiolitis compared with control infants, so overcrowding increase the risk of the infection, this may be related the easy communicability and rapid spread of the offending virus in such a close proximity between family members. Similar result was obtained by Robledo-Aceves et al [15].

Compared with those who were exclusive breast feeding for 4 months, more than a tripling in severe respiratory tract illnesses resulting in hospitalizations was noted for infants who were not breastfed [16]. There was a significant difference in control exclusive breast-fed infants and patients with bronchiolitis which is similar to Diyar K study[17]. As colostrum and breast milk contain large amount of IgA antibody, some of which is RSV specific, which is mainly directed against fusion protein of RSV, so breast feeding has a protective effect against bronchiolitis [18] which is essential in our study.

Cough was present in (88%) that agree with Muddather A. et al [11] who found that cough was present in (83.3%) . Shortness of breath was present in (81.3%) of infants less than 6 months of age and in (76%) % of infants more than 6 months of age, similar to Eser T. (68.1%) [19].

Poor feeding was present in (36%) of patients < 6months and (33.6%) of patients ≥6months.similar to Saud (52.5%) [20].

The respiratory rate was higher in patients younger than six months of age than patients older than six months of age which is similar study of Eser T. [19]and Saud [20].

Irritability was present in (61.3 %) of patients <6 months of age and (32.8%) of those ≥=6 months and this is similar to Muddather A. et al. who was present in (63.3%) of patients<6 months and (40.7%) of patients≥=6 months of age[11].

Fever is more common in patients younger than six months of age except for moderate fever (38.1–39°C), which agree with Qadori study [13], and disagree with Muddather A. et al. who found that fever was more in patients younger than 6 months, This difference may be due to different geographical areas [11].

Fine rales was present in (80 %) of patients <6 months of age and (74.4%) of those ≥6 months and this is agree with Diyar K. [17] who found that the fine rales were present in (86%) of patients.

Cyanosis was present in (26.7%) of patients in < 6 months which is similar to that found by Muddather A. et al [11] (30%), and it was seen in (16.8%) of patients in ≥ 6 months which is similar to that found by Eser T. study (13.8%) [19].

Our study demonstrate that there was no difference in radiological findings between infants with bronchiolitis under and over six months of age. Hyperinflation was present in (45.3%) of patients, which is similar to study of Muddather A. et al (39.3%) [11], Diyar K. found that the hyperinflation was present in (64%) [17]. Interstitial pneumonia was present in (16%) of patients which is similar to Saud (18.3%) [20]. Collaps seen in (2.6%), near that found by AL-Janabi study (1.2%) [21]. Normal x-ray finding seen in (28%) which is similar to Saud (24.2%) [20].

CONCLUSION

Bronchiolitis is a common disease during infancy. There was an association with urban residence, overcrowding, family history of smoking, low socio-economic status and male gender. The study show that there is a protective effect of breast feeding against brochiolitis. There was no difference of radiological findings between infants under and over 6 months of age.

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