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Bronchiolitis and its associated factors in pediatric hospital in Iraq, Diala (Albatool Teaching Hospital)

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Abstract

Background: Bronchiolitis is the most common disease of the lower respiratory tract. About 3% of infant younger than one year of age are admitted to the hospital with Bronchiolitis.
Objectives: To throw light on the occurrence of Bronchiolitis through studying cases in main teaching hospital in Diala city in IRAQ and to study some possible factors that may be associated with its occurrence.
Patients and Methods: This is a cross sectional study that was carried out during the period from January through June 2015 involving 320 patients with acute bronchiolitis admitted to Al Batool teaching hospital of paediatrics using a questionnaire that was applied through a direct interview.
Results: The results showed that 67.5% of the patients were males and 32.5% females, 60.6% were less than six months and 39.4% more than six months of age. . Fever was more common in infants that age less than six months it usually affects young infants; male more than female; more in urban areas, in families of low socioeconomic status and in families with high crowding index, it is also more common in families where the parents are smokers and when there are other members of the family having a history of upper respiratory tract infection.
Conclusion: Bronchiolitis is not uncommon in Diala city (according to the high rate of admission); there was a significant association between urban residence, parental smoking and overcrowding with acute Bronchiolitis. There was no significant association with family history of Bronchiolitis. There was no significant association with family history of atopy.

Keywords: Bronchiolitis, lower respiratory tract , Diala city, paediatrics.

Introduction

Bronchiolitis is a common disease of lower respiratory tract infection in infants resulting from inflammatory obstruction of the small airways. [1]

Bronchiolitis appear in yearly epidemics,[2, 3] which occur in either late fall, winter or spring and can last up to five month.[4-6] The outbreak is less seasonal in tropical climates but is concentrated in rainy season. [7]

Clinical definition:

There is no uniform definition of Bronchiolitis, and no definite age limitation. In 2006, a subcommittee of the American Academy of Paediatrics (AAP) together with the European Respiratory Society (ERS) underlined that Bronchiolitis is a clinical diagnosis, recognized as "a constellation of clinical symptoms and signs including a viral upper respiratory prodromal followed by increased respiratory efforts and wheezing in children less than two years of age" [8]

In Europe, wheezing is regarded as a less important finding.[9-10]

During the recent years, several studies about bronchiolitis from Europe and USA have included infants only up to 12 months of age. [9, 11, 12] Children hospitalized for wheezing between 12 and 24 months of age may have a higher risk for having asthma, and with different patho-physiology and prognosis. [9, 10, 13-16]

Aetiology:

- Respiratory syncytial virus (RSV) (45-75%): RSV is an RNA virus, has lipid envelop bearing to two glycoprotein, one of which is fusion protein; facilitate entry of virus into the cell.IgA antibody present in colostrum and milk is mainly directed against this fusion protein. [16, 17]

- Para influenza virus (4.3-22%) type III is the most important frequently causes illness during the first month of life,type IV causes mild illness [18]

- Influenza virus: type B (with a higher attack) rate causes less severe illness than that caused by type A. [19]

- Rhinoviruses (2%): infection rates are higher among infants and decrease with age

- Mumps virus [20]

- Mycoplasma pneumonia

The last four causes account for less than (7%). [21]

Pathophysiology:

The infection starts in the upper respiratory tract, spreading to the lower airways within few days. The inflammation in the bronchioles is characterized by a perbronchial infiltration of white blood cell types, mostly mononuclear cells, and oedema of the sub mucosa and adventitia.[11, 12] Damage may occur by a direct viral injury to the respiratory airway epithelium, or indirectly by activating immune responses. [12]

Oedema, mucus secretion, and damage of airway epithelium with necrosis may cause partial or total airflow obstruction, distal air trapping, atelectasis and a ventilation perfusion mismatch leading to hypoxemia and increased work of breathing. [13, 9]

Smooth-muscle constriction seems to play a minor role in the pathologic process of bronchiolitis. [9]

Epidemiology:

RSV is the most common virus involved in children with bronchiolitis, in most studies it accounts for 60–80% of the cases in children below 12 months of age. [13,15,22,23]. Dual infections are reported in 20–30% of children, but does not seem to be associated with increased severity. [10, 15, 22, 24]

RSV is transmitted by close contact and by self-inoculation of the conjunctiva or anterior nares. It may also spread by coarse aerosols but it inefficiently spreads by fine particles aerosols. [25]

Bronchiolitis is more common in male, in those with no breast feeding, and those who live in crowded conditions. Older family members are a common source of infection but may experience only minor respiratory symptoms. [1]
Colostrum and breast milk contain large amount of IgA antibody, some of which is RSV specific [26], which is mainly directed against fusion protein of RSV. [27] IgG anti-RSV antibodies are present in breast milk and in reactive T-lymphocytes. [28]

Bronchiolitis is a disease with high morbidity, but low mortality. Death from respiratory failure in bronchiolitis is rare and range for RSV bronchiolitis from 2.9 (UK) to 5.3 (USA) deaths per 100 000 children below 12 months. Differences may be caused by diagnostic procedures as well by socioeconomic conditions. A study from the UK underlines that the mortality rate for bronchiolitis in children below 12 months is low and falling, from 21.5 to 1.8 per 100 000 children (age 1 to 12 months) from 1979 to 2000, reflecting improvements in pediatrics' intensive care. [29]

Infants inhale milk and regurgitate then through nose and IgA collected in the respiratory tract might protect against severe respiratory infection. [26]

About 3% of infants younger than one year of age are admitted to the hospital with bronchiolitis. [30]

Risk factors for bronchiolitis:

- Male gender.
- History of prematurity.
- Young gestational age (less than 37 week of gestation).

- Being born in relation to the RSV season.
- Pre-existing disease such as bronco pulmonary dysplasia, underlying chronic lung disease, neuromuscular disease, congenital heart disease, exposure to environmental tobacco smoke
- No breastfeeding.
- Poor socioeconomic factors
- High parity.
- Young maternal age and maternal asthma.

However, the majority of children hospitalized for bronchiolitis have no underlying condition.[30- 31] The same conditions may also be risk factors for a more severe course. Recently, specific gene polymorphisms have been associated with a risk for more severe bronchiolitis. [32]

Clinical characteristics

Bronchiolitis often starts with rhinorrhoea and fever, there after gradually increases with signs of a lower respiratory tract infection including tachypnea, wheezing and cough. Very young children, particularly those with a history of prematurity, may appear with apnoea as their major symptom,[9, 10] feeding problems are common. On clinical examination, the major finding in the youngest children may be fine inspiratory crackles on auscultation, whereas high-pitched expiratory wheeze may be prominent in older children [9]. By observation, the infants may have increased respiratory rate, chest movements, prolonged expiration, recessions, and use of accessory muscles, cyanosis and decreased general condition. No formal scoring system for the severity of bronchiolitis exists, but a suggestion for the grading into mild, moderate and severe bronchiolitis.[33, 34]

In a study that included children with bronchiolitis from an out-patient clinic, the resolution of symptoms took more than 14 days in 40% of the children, and approximately 10% had symptoms after 4 weeks. [10]. The median length of hospitalization in a large study including children below 12 months was only one day.[35]

Differential diagnostic considerations: In most cases, the diagnosis of bronchiolitis is clinically evident and no further tests are indicated to rule out other diagnoses.[36] However, other diagnoses may be considered in a child with atypical presentations including severe respiratory distress, and recurrent symptoms, and in a child presenting with otherwise typical symptoms, but with no signs of a viral infection.[36]

Differential diagnosis may include gastro oesophageal reflux, laryngotracheobronchomalcia, pertussis, foreign body aspiration, vascular ring and other mediastina obstructions or other congenital lung diseases.

[36, 37] Asthma may be considered in oldest infants with recurrent episodes of wheeze, but the overlap with asthma is less likely when bronchiolitis is only defined in infants younger than 12 months of age.[38]

Management:

Clinical assessment

Risk factors for a severe course should be recognized, including young age which is associated with increased risk of apnoea, prolonged hospitalization, hypoxemia, admission to an ICU and the need to mechanical ventilation.[36, 38]

Laboratory assessment

Except for pulse oxymetry, no routine diagnostic tests have been shown to have a substantial impact on the clinical course of bronchiolitis, and recent guidelines and evidence-based reviews recommend that no diagnostic tests are used routine.[36, 38-41] Implementation of guidelines for the assessment and treatment of infants with bronchiolitis has reduced the use of diagnostic as well as therapeutic options, with a further reduction in costs and length of stay.[36] The clinical course and management of bronchiolitis are similar and not influenced by identification of the viral agent.[36, 38] However, identifying a viral aetiology is shown to reduce the use of antibiotics, the number of investigations and the length of stay.[37, 24] Dependent on the setting, a viral diagnosis may reduce nosocomial infections, which may have impact on the long-term prognosis. [42] Examination by chest X-ray may increase the rate of antibiotic prescription without improving any outcome, and may in less than 1% reveal lobar consolidations suggesting the need of antibiotics [39, 43]. An X-ray may, however, be more likely to add positivity in children with high and prolonged f disease and in children in need of admission to an ICU or mechanical ventilation. [40, 44]

Treatment

The disease is self-limiting, typically lasting between (7-10 days), so most infants are managed at home, often with primary care support which include adequate oral intake and antipyretic for fever. [1, 45]

General management:

Treatment of acute bronchiolitis is generally supportive, as no medical treatment has shown to improve important clinical outcomes, A conservative, "minimal handling" approach seems beneficial, especially for the youngest age group (<3 months). [46, 47]

A prone position may improve oxygenation and is suggested for infants if they are carefully observed.[46, 48] Careful nasal suctioning may be

For hospitalized patient the following treatment may be given:

Oxygen: There is no consensus on what level of oxygen saturation (SpO2) no randomized controlled trials (RCT) have compared alternative oxygen supplementation regimes.[46, 50] Observational studies, however, indicate that a goal of 90%, as compared to 94%, has the potential to significantly reduce length of hospital stay. [51, 52]

Fluid and nutrition: Maintaining hydration is an important part of the care of infants with bronchiolitis. Further, tachypnea and fever increases fluid loss, potentially worsening the dehydration.[53, 54] Oral feeding may be sustained in milder cases, if needed by small volume frequent feed, and breastfeeding should be encouraged. The advantage of IV fluids ever, oxygen saturation < 90%, Chronic cardiopulmonary could be a decreased risk of aspiration and no interference with breathing,[55, 56]

Through GT feeding, infants may achieve a better nutritional status and nitrogen balance, which may be beneficial for recovery, and may be a route for giving expressed breast milk.[54, 57]

There is not sufficient evidence for or against the use of GT feeding in infants with bronchiolitis,[56] and in a recent study from Australia no differences in major outcomes were found between the two methods.[58]

Antibiotics: Antibiotics are commonly prescribed in bronchiolitis, although they have no action against viruses. The only role for antibiotics is in complicated bronchiolitis where a secondary bacterial infection (streptococcus or staphylococcus) is suspected. This is rare, but not easily excluded in a sick infant with fever, toxicity and significant opacities on the chest radiograph. [59-61]

Bronchodilators: Patients give beta-agonist have shown improvement in clinical scores and atrial oxygen saturation. In addition, deterioration in lung function has been documented after beta- agonist's inhalation.[62]

Several randomize studies have demonstrated improvement in clinical score, respiratory, pulmonary mechanics, oxygen saturation, and length of hospitalization when epinephrine was used as bronchodilator.[63]

Steroids: A recent meta-analysis including 17 RCTs concluded that there is no beneficial effect of systemic corticosteroids in children with bronchiolitis, neither on rate of hospitalization for outpatients nor on length of stay for inpatients.[64] However, one study has shown a beneficial effect of dexamethasone in mechanically ventilated children, suggesting that this may be an option in critically ill patients. [65]

Antivirals: A Cochrane systematic review examined the effectiveness of nebulized ribavirin in infants and children with lower respiratory disease attributable to RSV infection.[66] There was a conflict within the review with regard to the acute infection phase. One study, which used a nebulized water placebo, suggested that nebulized ribavirin reduced length of hospital stay and days of mechanical ventilation.[67] Nebulized ribavirin is not recommended for treatment of acute bronchiolitis in infants.Ribavirin is expensive, hard to administer and must be given at very early time point during the course of the disease to have significant benefit. [68]

Discharging criteria: There are no established criteria for discharge, whether from the hospital or from an outpatient setting.

One clinical practice guideline suggest the following: [69]

- Respiratory rate <70 breaths/min.
- Caretaker can clear the infant's airway using bulb suctioning.

-Patient stable without supplemental oxygen.
-Patient has adequate oral intake to prevent dehydration.
- Caretaker is confident they can provide care at home.
- Education of the family is complete.

Prevention: The preventive measures include general measures and specific measures (immunoprophylaxis).

General measures: A careful barrier nursing measures may help in prevention of nosocomial (cross infection) in hospitals and ICUs.

Immuno-prophylaxis: Passive immune-prophylaxis using polyclonal or monoclonal antibodies to high risk infants before RSV season has been documented to reduce admission rates in infants with acute bronchiolitis.

Polyclonal antibodies: containing RSV IgG is prepared from pooled plasma, and administered by intravenous route before RSV season. The potential disadvantages associated with polyclonal antibodies include: need for intravenous access; risk of transmission of blood-borne infections, and possible interference with antibody response.[70] It has also been evaluated for treatment of acute bronchiolitis without success.[71]Bronchiolitis requiring admission in intensive care is not restricted to high risk group, the majority are healthy term infants without risk factor.

Monoclonal antibodies: Palivizumab is a humanized mouse IgG1 monoclonal antibody directed against site A and F glycoprotein of RSV. It reduces RSV infection associated hospitalization in high risk infants but does not reducemortality rates.[72] Economic analysis of prophylactic palivizumab has failed to show savings in the net cost due to very high cost of palivizumab. The 2006 Report of the Committee onInfectious Disease includes the following indications for the use of palivizumab: [73]

1. Children younger than 24 months of age with chronic lung disease (CLD) of prematurity who have required medical therapy for CLD within 6 months before the start of the RSV season.
2. Infants born at 28 weeks of gestation or earlier who are younger than 12 months of age at the start of the RSV season.
3. Infants born at 29 to 32 weeks of gestation who are younger than 6 months of age at the start of the RSV season.
4. Infants born between 32 and 35 weeks of gestation, who are younger than 6 months of age at the start of the RSV season and have 2 or more of the following risk factors: child care attendance, school-aged siblings, exposure to environmental air pollutants, or congenital abnormalities
5. Children who are 24 months of age or younger with hemo-dynamically significant cyanotic congenital heart disease.[74]

Objective of the study

To throw light on the occurrence of Bronchiolitis through studying cases in teaching hospital in Diala city and to study some possible factors that may be associated with its occurrence.

Patients and Methods

Study design and settings:

This is a cross sectional study that was conducted in major teaching hospital in IRAQ (AL-Batool Teaching Hospital of Paediatrics) during the period from January through June 2015.

Sample and sampling technique:

The source of data collection was the previously mentioned teaching hospital. The sampling technique was a consecutive non random sampling by pooling all the patients with chest infection attended the outpatient of AL-Batool Teaching Hospital during the period of data collection.

The sample included 320 patients age less than two years, the data collection process was conducted daily or every other day using a structured questionnaire that was developed by the researcher and the supervisor to collect data for the purpose of the study.

The questionnaire form consists of many parts starting with data about the socio-demographic variables like: age, sex, gestational age, residence, type of feeding, and socioeconomic status, the indicator of socioeconomic status was derived from many sources with some modifications, mainly from AL Mashhadani 1998; Soori 2001;Kim 2003;Sarlio2004.Four parameters were include as shown in the following table:

House ownership		Crowding index		Education level of father		Father occupation
Rental	0	High >4	0	Illiterate	0	Jobless
Owned	5	Medium (3-4)	1	Basic	1	*unskilled
		Low<3	2	Secondary	2	**Skilled
				University	3	

* unskilled includes manual worker and self employed.
**skilled includes institutional employment and professionals.
(0-4) low socioeconomic class
(5-8) medium socioeconomic class
(9-12) high socioeconomic class

The first part of questionnaire also contains number of persons per room, in addition to family history of atopy, family history of smoking smoking, and presence of concomitant respiratory infection in the family, congenital heart disease and history of congenital lung disease.

The other part of the questionnaire inquired about the presenting features (symptoms) of the child including fever, cough, shortness of breath, cyanosis, tachypnea, poor feeding and irritability.

The third part of the questionnaire was about signs like:Respiratory rate, Temperature, rales, chest retractions, palpable liver and cyanosis.

Definition of variables:

Fever: body temperature elevation over 100 °F (37.8 ° C)The normal human body temperature can be as high as 37.7 °C (99.9 °F) in the late afternoon.

Such elevations ranges from mild to extreme; body temperatures above 39.1 °C (104 °F) is considered as severe fever.

Respiratory rate: The number of breaths per minute or, more formally, the number of movements indicative of inspiration and expiration per unit time.

Average resting respiratory rates by age are:

- birth to 6 weeks: 30–60 breaths per minute
- 6 months: 25–40 breaths per minute

Rales: Rales are abnormal lung sounds characterized by discontinuous clicking or rattling sounds.

Chest retraction: are a sucking in of the skin in between or around the bones of the chest when inhaling. Retractions may occur in several areas of the chest and are a sign of increased use of the chest muscles for breathing. This usually is a sign of difficulty breathing.

Methods:

A verbal consent was taken from the mothers or the companions of the patients prior to the interview. All the babies were examined carefully by paediatrician focusing mainly on the respiratory system looking for signs of bronchiolitis. Hyperinflation examined clinically byhyperexpiation of the chest and by chest X- ray.

The data were coded, entered to the computer, and analysed using the available computer software facility of SPSS-18 (Statistical Package for Social Sciences- version 18).

The results were statistically analysed using Chi square test (or fisher exact test when appropriate) to test the significance of association for categorical variables. The cut-off point of the p- value set to be less than 0.05 to be considered as significant.

Results

A total sample of 320 patients was included in this study. The age of all patients was less than two years. The general characteristics of the patients are shown in Table (1). Regarding the age; the highest percentage of (60.6 %) was less than six months, more than two third of them were males (male to female ratio is 2:1), and 93.8% were borne full term.

According to the feeding pattern; 43.4% were on breast feeding, 34.4% mixed feeding and 22.2% of them were on bottle feeding, 68.8% live in urban areas, 13.8% of children's mothers were illiterate and 52.8% have finished secondary school and 33.4% graduated from college.

In respect to the socioeconomic status of the children's families; 38.8% were of low and 50.9% were of middle socioeconomic status, 26.6% had positive family history of atopy and 70% with family history of smoking while 78.7% had concomitant respiratory disease in their families. Previous admission to hospital was registered in 21.6%, children with history of congenital lung diseases form 5.9% and congenital heart diseases 8.8%.

Table (1): Distribution of the sample by demographic characteristics

		No	%
Age (months)	<6	194	60.6
	≥6	126	39.4
Gender	Male	216	67.5
	Female	104	32.5
Gestational age	Full term	300	93.8
	Preterm	20	6.3
Type of feeding	Breast	139	43.4
	Mixed	110	34.4
	Bottle	71	22.2
Residence	Urban	220	68.8
	Rural	100	31.2
Mother education	Illiterate	44	13.7
	Primary	113	35.3
	Secondary	125	39
	Collage	38	12
Mother occupation	Housewife	248	77.5
	Employed	72	22.5
Socio-economic status	Low	124	38.8
	Middle	163	50.9
	High	33	10.3
Overcrowding	Yes	245	76.6
	No	75	23.4
Family history of atopy		85	26.6
Family history of smoking		224	70.0
Concomitant respiratory diseases in the family		251	78.4
Previous admission to hospital		69	21.6
Congenital respiratory disease		19	5.9
Congenital cardiac disease		28	8.8

The relationship of some demographic characteristics with fever and cough is shown in Table (2), there was significant association between age and fever (P-value < 0.05).

Table (2): Relation of some demographic characteristics with fever and cough

Variables		Fever		p-value	Cough		p-value
		Yes	No		Yes	No	
Age	<6 month	128	66	**.014**	188	6	**.116**
	≥6	100	26		126	0	
Gender	Male	159	57	**.179**	211	5	**.668**
	Female	69	35		103	1	
Residence	Urban	149	71	**.039**	214	6	**.182**
	Rural	79	21		100	0	
Socio-economic status	Low	86	38	**.395**	123	1	**.386**
	Medium	121	42		159	4	
	High	21	12		32	1	
Over crowding	Yes	181	64	**.061**	240	5	**.693**
	No	47	28		74	1	
Concomitant respiratory dis in family	Yes	185	66	**.064**	247	4	**.613**
	No	43	26		67	2	
Family history of smoking	Yes	163	61	**.359**	219	5	**.673**
	No	65	31		95	1	
Family history of atopy	yes	55	30	**.120**	84	1	**.580**
	no	173	62		230	5	

The relationship between some demographic characteristics and irritability and shortness of breath is shown in Table (3), there was significant association between shortness of breath and gender (P-value < 0.05).

Table (3): Relationship between some demographic characteristics and irritability / shortness of breath

Variables		Irritability		p-value	SOB		p-value
		Yes	No		Yes	No	
Age	<6 month	157	37	**.065**	138	56	**.18**
	≥6	90	36		80	46	
Gender	Male	169	47	**.518**	157	59	**.012**
	Female	78	26		61	43	
Residence	Urban	167	53	**.419**	145	75	**.207**
	rural	80	20		73	27	
Socio-economic status	Low	98	26	**.307**	85	39	**.613**
	Medium	127	36		113	50	
	High	22	11		20	13	
Over crowding	Yes	192	53	**.363**	167	78	**.979**
	No	55	20		51	24	
Concomitant respiratory dis in family	yes	197	54	**.291**	168	83	**.383**
	no	50	19		50	19	
Family history of smoking	yes	175	49	**.542**	155	69	**.530**
	no	72	24		63	33	
Family history of atopy	yes	64	21	**.627**	52	33	**.109**
	no	183	52		166	69	

The relationship between poor feeding and demographic characteristics is shown in Table (4), there was no significant association between poor feeding and demographic characteristic (P-value > 0.05)

Table (4): Relation of some demographic characteristics to poor feeding

Variables		Poor feeding		p-value
		Yes	no	
Age	<6 month	105	89	**.37**
	≥6	61	65	
Gender	Male	111	105	**.802**
	Female	55	49	
Residence	Urban	111	109	**.451**
	Rural	55	45	
Socio-economic status	Low	63	61	**.837**
	Medium	87	76	
	High	16	17	
Over crowding	Yes	128	117	**.811**
	No	38	37	
Concomitant respiratory dis in family	Yes	129	122	**.743**
	No	37	32	
Family history of smoking	Yes	116	108	**.961**
	No	50	46	
Family history of atopy	Yes	45	40	**.818**
	No	121	114	

Physical findings:

The relation between Patient's physical sings with age are shown in Table (5), there was no significant association between physical sings with age (P-value > 0.05).

Table (5): Patient's physical sings with age

Variables		Age				P-value
		<6 month		≥6 months		
		No.	%	No.	%	
Fever	<38	170	87.6	95	75	**.22**
	38-39	18	9.2	17	13	
	>39.1	6	3.2	14	12	
Respiratory rate	<60	24	12	36	29	**.007**
	60-80	137	70	63	50	
	>80	33	18	27	21	
Rales	Yes	180	93	114	90	**.60**
	No	14	7	12	10	
Retraction	Yes	43	22	26	20	**.84**
	No	151	78	100	80	
Liver span>2cm	Yes	32	16	19	15	**.87**
	No	162	84	107	85	
Cyanosis	Yes	25	13	12	9.5	**.45**
	No	169	87	114	90.5	
x- ray findings	Yes	162	83.5	105	84	**.92**
	No	32	16.5	21	16	

The relations between physical signs and residence is shown in Table (6), There was no significant association between patient's physical signs and residence (P-value > 0.05).

Table (6): Patient' s physical sings with residence

Physical signs		Residence				P-value
		Urban		Rural		
		No.	%	No.	%	
Fever	<38	185	85	80	80	**.659**
	38-39	22	10	13	13	
	>39.1	13	5	7	7	
Respiratory rate	<60	44	20	16	16	**.142**
	60-80	141	64	59	59	
	>80	35	16	25	25	
Rales	Yes	205	93	89	89	**.204**
	No	15	7	11	11	
Retraction	Yes	44	20	25	25	**.313**
	No	176	80	75	75	
Liver span>2cm	Yes	33	15	18	18	**.497**
	No	187	85	82	82	
Cyanosis	Yes	21	9.5	16	16	**.094**
	No	199	90.5	84	84	
x- ray findings	Positive	182	82.7	85	85	**.612**
	Negative	38	17.3	15	15	

The relation between Patient's physical sings and socio-economic status is show in Table (7), there was no significant association between patient's physical sings and socio-economic status (P-value > 0.05).

Table (7): Patient's physical sings and socio-economic status

Physical signs		Socio-economic status						P-value
		Low		Medium		High		
		No.	%	No.	%	No.	%	
Fever	<38	103	83	134	82	28	85	**.900**
	38-39	14	11	17	10	4	12	
	>39.1	7	6	12	8	1	3	
Respiratory rate	<60	24	19	28	17	8	24	**.496**
	60-80	72	58	107	66	21	63	
	>80	28	23	28	17	4	13	
Rales	Yes	112	90	151	93	31	94	**.699**
	No	12	10	12	7	2	6	
Retraction	Yes	28	23	34	21	7	21	**.939**
	No	96	77	129	79	26	79	
Liver span>2cm	Yes	23	19	25	15	3	9	**.401**
	No	101	81	138	85	30	91	
Cyanosis	Yes	17	14	18	11	2	6	**.454**
	No	107	86	145	89	31	94	
x- ray findings	Positive	106	85	135	83	26	78	**.626**
	Negative	18	15	28	17	7	22	

The relation between occurrence of physical sings and gestational age is shown in Table (8), there was no significant association between physical sings of patients and gestational age (P-value > 0.05).

Table (8): Patient's physical sings and gestational age

Physical signs		Gestational age				P-value
		Preterm		Full-term		
		No.	%	No.	%	
Fever	<38	249	83	16	80	**.821**
	38-39	32	10.6	3	15	
	>39.1	19	6.4	1	5	
Respiratory rate	<60	53	19	7	35	**.131**
	60-80	191	64	9	45	
	>80	56	17	4	20	
Rales	Yes	275	92	19	95	**.597**
	No	25	8	1	5	
Retraction	Yes	63	21	6	30	**.343**
	No	237	79	14	70	
Liver span>2cm	Yes	46	16	5	25	**.253**
	No	254	84	15	75	
Cyanosis	Yes	35	12	2	10	**.821**
	No	265	88	18	90	
x- ray findings	Positive	251	84	16	80	**.669**
	Negative	49	16	4	20	

The relationship between patient's physical findings and over- crowding is shown in Table (9), there was no significant association between patient's physical findings and over- crowding (P-value > 0.05).

Table (9): Patient's physical sings and over- crowding

Physical signs		Over crowding				P-value
		Yes		No		
		No.	%	No.	%	
Fever	<38	205	83%	60	80	**.479**
	38-39	24	9%	11	14.6	
	>39.1	16	7.5%	4	4.4	
Respiratory rate	<60	46	19	14	18.6	**.800**
	60-80	155	63	45	60	
	>80	44	18	16	11.4	
Rales	Yes	225	92	69	92	**.964**
	No	20	8	6	8	
Retraction	Yes	51	21	18	24	**.557**
	No	194	79	57	76	
Liver span>2cm	Yes	38	15.5	13	17.3	**.706**
	No	207	84.5	62	82.7	
Cyanosis	Yes	26	10.6	11	14.6	**.337**
	No	219	89.5	64	85.4	
x- ray findings	Positive	200	81.5	67	89.3	**.116**
	Negative	45	18.5	8	10.7	

The relationship between physical findings and family history of atopy is shown in Table (10), there was no significant association between physical finding and family history of atopy (P-value > 0.05).

Table (10): patient's physical signs and family history of atopy

Physical signs		Family history of atopy				P-value
		Yes		No		
		No.	%	No.	%	
Fever	<38	68	80	197	85	**.278**
	38-39	13	15	22	10	
	>39.1	4	5	16	5	
Respiratory rate	<60	18	21	42	18	**.787**
	60-80	51	60	149	64	
	>80	16	19	44	18	
Rales	Yes	78	92	216	93	**.965**
	No	7	8	19	7	
Retraction	Yes	20	23.5	49	21	**.607**
	No	65	76.5	186	79	
Liver span>2cm	Yes	11	13	40	17	**.378**
	No	74	87	195	83	
Cyanosis	Yes	11	13	26	11	**.643**
	No	74	87	209	89	
x- ray findings	Positive	66	77.3	201	86.6	
	Negative	19	22.5	34	13.4	**.094**

The relationship of patient's physical findings and family history of smoking are shown in Table (11), there was a significant association between (fever, x-ray findings) and family history of smoking (P < 0.05).

Table (11): Patient's physical findings and family history of smoking

Physical signs		Family history of Smoking				P-value
		Yes		No		
		No.	%	No.	%	
Fever	<38	192	85.7	73	76	**.078**
	38-39	19	8.4	16	16.6	
	>39.1	13	5.9	7	7.4	
Respiratory rate	<60	40	17.8	20	20.7	**.177**
	60-80	147	65.6	53	55.2	
	>80	37	16.6	23	24	
Rales	Yes	205	91.5	89	92.7	**.721**
	No	19	8.5	7	7.3	
Retraction	Yes	44	19.6	25	26	**.202**
	No	180	80.4	71	74	
Liver span>2cm	Yes	35	15.6	16	16.6	**.816**
	No	189	84.4	80	83.4	
Cyanosis	Yes	23	10.2	14	14.5	**.269**
	No	201	89.8	82	85.5	
x- ray findings	Positive	192	85.7	75	78	
	Negative	32	14.3	21	22	**.094**

The relation between Patient's physical findings and previous history of admission to hospital is shown in Table (12), (fever, respiratory rate, retraction, liver span, and cyanosis) were associated with previous history of admission to hospital (P-value < 0.05).

Table (12): Patient's physical findings and previous history of admission to hospital

Physical signs		Previous history of admission to hospital		P-value
		Yes	No	
Fever	<38	44	220	**.000**
	38-39	16	19	
	>39.1	9	11	
Respiratory rate	<60	16	44	**.000**
	60-80	28	171	
	>80	25	35	
Rales	Yes	61	232	**.238**
	No	8	18	
Retraction	Yes	25	44	**.001**
	No	44	206	
Liver span>2cm	Yes	20	31	**.001**
	No	49	219	
Cyanosis	Yes	14	23	**.011**
	No	55	227	
x- ray findings	Positive	59	207	**.593**
	Negative	10	43	

Table (13) shows that the relationship between Patient's physical findings and history of congenital heart disease which was significant (P-value < 0.05) except rales

.

Table (13): Patient's physical findings and history of congenital heart disease

Physical signs		Congenital heart disease				P-value
		Yes		No		
		No.	%	No.	%	
Fever	<38	7	25	258	88	**.000**
	38-39	11	39.2	24	8.2	
	>39.1	10	35.7	10	3.4	
Respiratory rate	<60	2	10.7	58	19.8	**.000**
	60-80	3	10.7	197	67.4	
	>80	23	82.1	37	12.6	
Rales	Yes	26	92.8	268	91.7	**.842**
	No	2	7.2	24	8.3	
Retraction	Yes	21	75	48	16.4	**.000**
	No	7	25	244	83.6	
Liver span>2cm	Yes	19	67.8	32	10.9	**.000**
	No	9	32.2	260	89.1	
Cyanosis	Yes	16	57.1	21	7.1	**.000**
	No	12	42.9	271	92.9	
x- ray findings	Positive	27	96.4	240	82.1	**.053**
	Negative	1	3.6	52	17.9	

The relationship between Patient's physical findings and history of congenital lung disease is shown in Table (14), there was a significant association between (fever, respiratory rate, retraction, liver span >2cm, cyanosis) and history of congenital lung disease (P-value < 0.05).

Table (14): Patient's physical findings and history of congenital lung disease

Physical signs		Congenital lung disease				P-value
		Yes		No		
		No.	%	No.	%	
Fever	<38	6	31.5	259	86	**.000**
	38-39	12	63.1	23	7.6	
	>39.1	1	5.4	19	6.3	
Respiratory rate	<60	2	10.5	58	19.2	**.000**
	60-80	6	31.5	194	64.4	
	>80	11	58	49	16.4	
Rales	Yes	17	89.4	277	92	**.693**
	No	2	9.6	24	8	
Retraction	Yes	13	68.4	56	18.6	**.000**
	No	6	31.6	245	81.4	
Liver span>2cm	Yes	9	47.3	42	13.9	**.000**
	No	10	52.7	259	85.1	
Cyanosis	Yes	10	52.6	27	8.9	**.000**
	No	9	47.4	274	91.1	
x- ray findings	Positive	17	89.4	250	83	**.466**
	Negative	2	10.6	51	17	

Discussion

Bronchiolitis typically affects children younger than two years with a peak incidence between two and six months of age. In this study; the peak age was less than six months, this agrees with Nazar study in Mosul 1993 who found that the peak age was two months. [80]

The results showed that male to female ratio is 2:1 and there is no significant difference in the severity of illness between males and females, Nazar study found that male to female ratio is 1.6:1 and there is no difference in the severity of illness between males and females; while Holsberg*et al* consider male sex as a risk factors for RSV infection in infants. [81]

In the current study; 6.3% of the patients were borne premature (less than 37 weeks gestational age); while in Nazar study 3.75% were premature. [80]

The results also revealed that Bronchiolitis is more common in urban areas 68.8% than in rural areas 27.3%, there is a significant association between Bronchiolitis and urban residence, and this might be due to the greater opportunities for spread of viruses in urban areas due to overcrowding, AL-Janabi study 2006found that 60% of the cases of bronchiolitis were seen in urban areas and 40% in rural areas. [82]

In this study; the disease seems more common in middle socioeconomicstratum 50.9% while in Nazar study it was more common in low socioeconomic stratum.[80] The overcrowding in the current study reported to be 76.6% which might help increase the risk of infection, the same was found in Nazar study 76.3%.[80]

Bronchiolitis and atopy (eczema, hay fever, rhinorrhea, and dry or food allergy) are two separated entities which have a number of features in common and overlap in the age range in which they affect children. [83] In this study; family history of atopy 26.6% was almost similar to Nazar study 26.9%. [80]

Smoking habit in the family was 70% which is almost similar to Nazar study 69.4%. Passive smoking had a negative dose dependent effect on lung function in healthy child. [84]

In the current study; children with Bronchiolitis and congenital heart disease forms 8.8%; while in three further observational studies infants with CHD accounted for 6.4% to 12% of all RSV associated hospital admissions. [85-87]

According to the results of our study; the percentage of children with Bronchiolitis that have congenital lung diseases was 5.9%,Greenough*et al* 2000 prospective study about the use of healthcare resources in infants with chronic lung disease born at 32 weeks of gestation or less found that during the first two years after birth 45 infants 19% had at least one hospital admission for a proven RSV infection and 24 10% had at least one admission for probable bronchiolitis. [88] This increased rate of hospitalization (with RSV infection) in those with underlying chronic lung disease is also shown in five retrospective cohort studies, some of which included full-term infants. [85, 86, 89]

In the current study; fever and cough were more common in children age less than six months; also irritability, SOB and poor feeding were more common in children age less than six months, this disagree withNazar study which showed irritability, SOB and poor feeding were more common in children age more than six months .[80] Fever less than 38 c was more common in children age less than six months 87.6 % while fever more than 39c was seen in children age more than six months 11.2%, Carlsen*et al* 1980 found that 50% of the cases have fever and 17% of the cases had high fever. [90] In bronchiolitis usually there is usually fever of (38.5-39C) but it may reach up to (39.5-40C). [1]

The results showed that respiratory rate is higher in patients less than six months of age than patients older than six months. Cherian*et al* found that respiratory rate above 50 ⁄ min. were the best indicator of lower respiratory tract infections with sensitivity 89% and specificity 92 %.[91]

The results also revealed that rales is more in children age less than six months 92.8%, this goes with Al-Janabistudy which found that rales are more in children age less than six months 66.2% .[82]

Chest retraction finding seen to be more common in infant's age less than six months 22.2%, Al-Janabistudy stated that chest retraction findingis more in children age less than six months 20 %. [82]

In this study; liver span more than 2cm is more common in children age less than six months 16.5%, Nazar study found the same 18.6%.[80]

Liver breadth below costal margin is not associated with hypoxaemia in acute bronchiolitis. [92]

In the current study; cyanosis is more common in children age less than six months 12.9%, Al-Janabistudy found the same finding in 20%. [82]

The results revealed that chest x-ray findings are more common in children age less than six months 83.5%, the same finding was found in Al-Janabistudy in 80%.[82]

The results also revealed that patient with bronchiolitis in males was more than in females, this is hard to explain although it is known that males at this age are more fragile than females, Koehoorn*et al* study found that males have an increased risk of bronchiolitis and also more severe disease with hospital admission which may be related to airway mechanics and having relatively smaller airways compared with females. [91]

In this study; living in urban areas is associated with an increased number of patients with Bronchiolitis; that might be explained as a result of overcrowding and atmospheric pollution compared to rural areas, Nick Spencer *et al* study found that increased risk of respiratory infection in children from more deprived families has been attributed to higher levels of parental smoking, in this study living in a house classified by the health visitor as 'smoky' was associated with a significant increase in risk of disease. [94]

The results showed that the bronchiolitis in preterm infants is more than term babies, Weisman study found that premature infants are known to be at increased risk of severe bronchiolitis illness because lung maturity occurs in the 37th week of gestation, so lung weights and volumes are significantly lower in preterm infants compared to term babies,besides, premature lungs have fewer and narrower alveoli compared to those in term babies. [95]

Overcrowding and bad ventilation appear to be too blamed for the high severity of Bronchiolitis infections in our study. A range of mechanisms have been proposed as links between dwelling crowding and disease, including increased exposures to allergens,

respiratory irritants and infectious agents in crowded dwellings. A number of epidemiological studies using different measures of crowding such as (total number of residents in the house, number of siblings, number of persons sharing the bed, room occupancy, and population density) have reported an association between crowding and respiratory diseases. [97]

Another case- control study conducted in South America using three indicators of crowding, reported for inpatients odds ratios of the order of two associated with living in a household with more than two persons per room, with more than four siblings, and bed sharing. Reported an association between household crowding and increased incidence of acute lower respiratory infection in young children [98]

Overcrowding may plausibly increase the risk of respiratory infection by increasing the opportunity for cross infection among the family. The agents of such infections are readily transmitted, usually through air by droplets or aerosols, in crowded and ill-ventilated rooms where people are sneezing, coughing or simply talking.

The results showed no significant association between family history of atopy and severity of Bronchiolitis, while Murray *et al* study 1992 found that family history of atopy significantly increases the risk of bronchiolitis and seems to be one of the significant risk factor in first order family members for childhood bronchiolitis. [99]

Smoking in the family is associated with an increased occurrence of bronchiolitis of infants when compared with non-smoking families in this study, there is some evidence to suggest that both in utero exposure to tobacco from maternal smoking[94] and postnatal exposure are associated with an increased severity and risk and of hospital admission for bronchiolitis.[100]
The history of previous admission to hospital; the results showed that infants with previous history of admission to hospitals were more than infants never admitted to hospitals, this may indicate that repeated admissions to hospital may increase the chance for the infant to catch other diseases especially respiratory disease and that when the infant has a disease that needs hospital admission may has some problem in his immunity that makes him/her more susceptible to get a severe form of Bronchiolitis or other diseases.

The results of the current study revealed that the presence of congenital lung disease is associated with an increased occurrence of Bronchiolitis, and this agrees with Koehoorn study which showed that infants with underlying congenital anomalies or chronic lung diseases such as cystic fibrosis even born at term also have increased risk for more severe disease and admission to hospital. [94]

The results also showed that the presence of congenital heart disease is associated with an increased occurence of Bronchiolitis in infants; in Eriksson *et al* study 2002; it was found that infants with congenital heart disease have a higher risk of severe disease with Bronchiolitis infection and account for around 6.4% of admissions in some cohort studies. [85]

Conclusion

1- Bronchiolitis is a common disease of infants that leads to a large number of acute admissions to hospital in winter and spring; usually it affects young infants; male more than female; more in urban than rural area.

2- Bronchiolitis is more common in middle socioeconomic status families, in those whose parents are smokers and in overcrowding and those when other members of the family have upper respiratory tract infections.

3-Family history of atopy was shown to be not strongly related to the occurrence of Bronchiolitis.

4- Acute bronchiolitis remains a common problem for young infants.

Recommendations

1- It is particularly important to avoid transmission ofinfection to high risk infants and children in hospitalswith other comorbidities.

2- Special care should be directed towards young infants (less than six months of age as this is the most common group to be affected and at the same time; the most vulnerable group.

3- This study calls attention for further researches to define the risk factors of Bronchiolitis and to understand more fully these factors.

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The questionnaire:

Age in month: ☐

Sex: male ☐ female ☐

Gestational age: preterm ☐ term ☐

Residence: urban ☐ rural ☐

Father education: illiterate ☐ primary school ☐ secondary school ☐ collage ☐

Father Job: jobless ☐ unskilled ☐ skilled ☐

Mother education: illiterate ☐ primary school ☐ secondary school ☐ collage ☐

Mother Job: house wife ☐ employed ☐

Socioeconomic status of the family: Low ☐ medium ☐ high ☐

Family history of atopy: Yes ☐ No ☐

Family history of smoking: yes ☐ no ☐

Concomitant respiratory infection in the family: Yes ☐ No ☐

Crowding index: normal ☐ high ☐

Type of feeding: breast ☐ ottle ☐ mixed ☐

Previous admission to hospital: yes ☐ No ☐

Congenital respiratory disease: Yes ☐ No ☐

Congenital cardiac disease: : Yes ☐ No ☐

Mode of presentation

Fever ☐ cough ☐ Irritability ☐

Shortness of breath ☐ poor feeding ☐

R.R: ☐ Temp: ☐ Rales: ☐

Subcostal &/or intercostal retractions: ☐

Palpable liver ☐ Cyanosis: ☐

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