



Evaluation of Children (<2 Years Old) with Respiratory Syncytial Virus Bronchiolitis in Terms of Disease Course and the Requirements of Additional Treatment

Respiratuar Sinsisyal Virüs Bronşiyoliti Olan Çocukların (<2 Yaş) Hastalığın Seyri ve İlave Tedavi Gereksinimleri Açısından Değerlendirilmesi

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ABSTRACT

Aim: To evaluate the demographic and clinical characteristics of children and the types and frequencies of treatments given in the setting of respiratory syncytial virus (RSV) bronchiolitis.

Material and Method: Sixty-three children (39 females, 24 males; mean age 8.7 months; range 2 to 24 months) were diagnosed with acute bronchiolitis due to RSV between November 2017 to February 2018. The microbiological diagnosis was made with the detection of RSV antigens by the immunochromatographic assay. Retrospective data included risk factors, symptoms and signs at presentation, laboratory and radiographic findings, and treatment methods.

Results: Fifty-three patients (84.1%) were younger than 12 months. The birth weights were between 1,600 and 4,250 g and the gestational ages were between 31 and 41 weeks. Prematurity was found in 11 patients (17.5%), and comorbid conditions 17 patients (27%). Hospitalization was required in 34 patients (54%), of whom three patients (4.8%) were further admitted to the intensive care unit. The following treatment modalities were more frequently used: multiple bronchodilators for comorbidities (35.3%), tachypnea (29.7%); inhaled steroid therapy for hypoxemia (90.9%), tachypnea (89.2%); systemic steroid treatment for tachypnea (40.5%); intravenous fluid therapy for tachypnea (78.4%); antibiotherapyfor comorbidities (76.5%). Hospitalization was more frequently required in patients with tachypnea (83.8%) and, hypercarbia (83.3%). Treatment methods significantly differed between patients with and without comorbidity, age <12 months, tachypnea. (p<0.05).

Conclusions: The presence of comorbid conditions and tachypnea seems to play a critical role in determining the need for treatment. Tachypnea as a symptom can help predict the need for hospitalization, as well as multiple bronchodilator therapy, steroid therapy, and antibiotic use for the treatment. The presence of tachypnea, hypoxemia, comorbidity, and radiographic infiltration seems to be associated with the need for antibiotics. In addition, the presence of infiltration on chest X-ray, acidosis, hypoxemia, and hypercarbia are also indicators of hospitalization.

Keywords: Bronchiolitis, infant, respiratory syncytial virus, tachypnea, treatment

ÖZ

Amaç: Respiratuar sinsisyal virüs (RSV) bronşiyoliti tedavi sürecinde çocukların demografik ve klinik özelliklerini ve verilen tedavilerin türlerini ve sıklıklarını değerlendirmek.

Gereç ve Yöntem: Kasım 2017-Şubat 2018 tarihleri arasında 63 çocuğa (39 kız, 24 erkek; ort. yaş 8,7 ay; dağılım 2-24 ay) RSV'ye bağlı akut bronşiyolit tanısı kondu. Mikrobiyolojik tanı, İmmünokromatografik yöntemle ile RSV antijenleri tespit edilerek yapıldı. Risk faktörleri, başvuru anındaki semptom ve bulgular, laboratuvar ve radyografik bulgular ve tedavi yöntemleri gibi bilgiler retrospektif olarak tarandı.

Bulgular: Elli üç hasta (%84,1) 12 aydan küçüktü. Doğum ağırlıkları 1600 ile 4250 gr arasında ve gebelik yaşları 31 ile 41 hafta arasındaydı. 11 hastada (%17,5) prematüre, 17 hastada (%27) ek hastalık saptandı. 34 (%54) hastada yatış gerekli ve bunların üçü (%4,8) yoğun bakıma alındı. Aşağıdaki tedavi modaliteleri belirtilen durumlarda daha sık kullanılmıştır: çoklu bronkodilatörler, komorbid durumlar (%35,3) ve takipne (%29,7) varlığında; inhale steroid tedavisi, hipoksemi (%90,9) ve takipne (%89,2) varlığında; sistemik steroid tedavisi, takipne (%40,5) varlığında; intravenöz sıvı tedavisi, takipne (%78,4) varlığında; antibiyoterapi, komorbid durum (%76,5) varlığında daha sık kullanılmıştır. Takipne (%83,8) ve hiperkarbi (%83,3) olan hastalarda hastaneye yatış daha sık gerekmiştir. Tedavi yöntemleri, komorbidite, yaş <12 ay ve takipnesi olan ve olmayan hastalar arasında anlamlı farklılık gösterdi (p<0,05).

Sonuç: Komorbid durumların varlığı ve takipne, tedavi ihtiyacının belirlenmesinde kritik bir rol oynuyor gibi görünmektedir. Takipne bir semptom olarak hastaneye yatış ihtiyacını öngörmenin yanısıra, çoklu bronkodilatör tedavisi, steroid tedavisi ve antibiyotik tedavisini öngörme konusunda da yardımcı olabilir. Takipne, hipoksemi, komorbidite ve radyografik infiltrasyonun varlığı, antibiyotik ihtiyacı ile ilişkili görünmektedir. Ayrıca akciğer grafisinde infiltrasyon varlığı, asidoz, hipoksemi ve hiperkarbi de hastaneye yatış göstergesidir.

Anahtar Kelimeler: Bronşiyolit, infant, respiratuar sinsisyal virüs, takipne, tedavi

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INTRODUCTION

Acute bronchiolitis is a viral lower respiratory tract disease characterized by obstruction of the small airways. The mortality ratio associated with bronchiolitis is estimated to be 2 per 100.000 live births (1). Among the causes of bronchiolitis, respiratory syncytial virus (RSV) is the most frequent cause, with a wide range of presentations from slight viral upper respiratory tract symptoms to respiratory failure (2). Patients may develop infectious complications, dehydration, respiratory distress, and/or insufficiency, which may require oxygenation, bronchodilator medications, intravenous fluid therapy, antibiotics, and other noninvasive or invasive ventilation treatments. The decision for the type of treatment is usually made based on the findings or complications identified during the course of the disease. It has been shown that RSV affects at least 50% of children during the first year of life and almost all children till the age of 2 years (3), and that 1-3% of all children require RSV-associated hospitalizations during the first year of life, with 0.1-2% requiring mechanical ventilation due to severe lower respiratory tract infections (4,5). Of children admitted with RSV, 8% require intensive care (6) and up to 3% are at risk for mortality (7). In particular, high-risk children are at an increased risk for morbidity and mortality. Risk factors include the first 6 weeks after birth, prematurity, chronic lung diseases such as bronchopulmonary dysplasia, congenital heart diseases resulting in impaired hemodynamic status and, in particular, pulmonary hypertension, congenital or acquired immunodeficiency, neuromuscular diseases, and low socioeconomic status (8-10). Mortality associated with RSV infections may be as high as 35% in children with risk factors (8). This study aimed to evaluate the demographic and clinical characteristics of children and the types and frequencies of treatments given in the setting of RSV-associated bronchiolitis.

MATERIAL AND METHOD

Study population and definition

The study included 63 infants and children, ages up to 2 years, who were diagnosed with acute bronchiolitis due to RSV (ICD-10-CM Diagnosis Code J21.0) during a three-month interval from November 2017 to February 2018. The patients were divided into two age groups <12 months and ≥12 months. All data were obtained retrospectively from the hospital and patient records.

At our center, microbiological diagnosis of RSV is made with the detection of RSV antigens by the immunochromatographic assay as the routine part of patient care for bronchiolitis. In all patients, RSV antigens were demonstrated in the nasopharyngeal aspiration samples by the chromatographic immunoassay method using a commercial kit (CerTestBiotec®, Zaragoza, Spain).

A detailed inquiry was made into risk factors that could worsen the course of the disease, including comorbidities (congenital heart diseases, bronchopulmonary dysplasia, and other chronic lung diseases, metabolic disease, malignancy/immunosuppression, central nervous system diseases, gastrointestinal diseases), and history of prematurity (<38. gestational weeks) and low-birth weight (<10th percentile for gestational age). Symptoms and findings of physical examination were recorded, in particular, fever, cough, rhinorrhea, dyspnea, tachypnea, decreased oral intake, and dehydration. Laboratory [CBC, C-reactive protein (CRP), blood gas analysis] and imaging findings were examined to determine leukocytosis, leukopenia, elevated CRP, hypoxemia, hypercarbia, acidosis, and infiltration or atelectasis on a chest X-ray. The sections where treatments were applied (emergency green zone, emergency yellow zone, pediatric wards, pediatric intensive care unit) and the treatment methods (intravenous fluid therapy, antibiotics, systemic or inhaled steroid treatment) were recorded as well as data on presentation, admission, discharge or referral. In addition, the use of multiple bronchodilators and/or antibiotic treatments was inquired about in the same patient during the same time interval. The symptoms and clinical and laboratory findings of the patients were classified according to the zones of monitoring and care and treatment methods.

Statistical Analysis

We investigated whether there were any statistical differences in treatment and hospitalization between patients with comorbidity, prematurity, acidosis, hypoxemia, hypercarbia, leukocytosis, leukopenia, positive radiologic findings, tachypnea, antibiotic use, multiple antibiotic use, systemic steroid use, and inhaled steroid use. Data were analyzed using the SPSS version 23 statistical software package. The P values of the Chi-square test and Fisher's exact test were taken into account for data having frequencies of greater than and less than 5, respectively. A P value of less than 0.05 was accepted as statistically significant.

Ethics Statement

The present study protocol was reviewed and approved by the Marmara University Faculty of Medicine Clinical Research Ethics Committee (approval No. 09.2017.389). Informed consent was submitted by all subjects when they were enrolled. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

RESULTS

Demographic Characteristics

The demographic, clinical, and laboratory findings of the patients are summarized in Table 1. Of 63 patients treated with the diagnosis of RSV bronchiolitis, 39 were



females and 24 were males, with a mean age of 8.7 months (range, 2 to 24 months). The majority of the patients (n=53, 84.1%) were 0-12 months old. The birth weights of the patients were between 1,600 and 4,250 grams and the gestational ages were between 31 and 41 weeks. Prematurity was found in 17.5% of the patients, and comorbid conditions in 27% (Table 1).

Table 1. Demographic findings of the patients	
	n (%)
Gender	
Male	24 (38.1)
Female	39 (61.9)
Age (Mean:8.7 months)	
< 12 months	53 (84.1)
≥ 12 months	10 (15.9)
Prematurity	11 (17.5)
Comorbid conditions	17 (27.0)
Central nervous system disease	5 (29.4)
Chronic pulmonary disease	4 (23.5)
Congenital heart disease	4 (23.5)
Malignancy/immunosuppression	3 (17.6)
Gastrointestinal system disease	1 (5.9)

Symptoms and Signs

The presenting symptoms and signs in a descending frequency were cough (81%), rhinorrhea (71.4%), dyspnea (61%), tachypnea (58.7%), hypoxemia (34.9%), fever (27%), and dehydration (25.4%) (Table 2). A chest X-ray was obtained in 92.1% of the patients, blood gas analysis in 79.4%, hemogram in 77.8%, and C-reactive protein (CRP) in 77.8%, with corresponding results of decompensated respiratory acidosis in 7.9%, compensated respiratory acidosis in 6.3%, pulmonary infiltration in 63.5%, elevated CRP (>3.3 mg/L) in 28.5%, leukocytosis in 12.7%, and leukopenia in 3.2% (Table 2).

Table 2. Clinical and laboratory findings of the patients	
Symptoms, signs, and laboratory findings	n (%)
Cough	53 (81.0)
Rhinorrhea	45 (71.4)
Dyspnea	41 (61.0)
Tachypnea	37 (58.7)
Hypoxemia	22 (34.9)
Fever	17 (27.0)
Dehydration	16 (25.4)
Respiratory acidosis	9 (14.2)
Decompensated	5 (7.9)
Compensated	4 (6.3%)
Elevated CRP(>3.3 mg/L)	18 (28.5)
Leukocytosis	8 (12.7)
Leukopenia	2 (3.2)
Pulmonary infiltration	40 (63.5)
Paracardiac infiltration	37 (59.5)
Lobar infiltration	3 (4.8)
Atelectasis	1 (1.6)

Monitoring and Treatment

Hospitalization was required in 54%, including 22 patients (34.9%) hospitalized in the pediatric ward, and 12 patients (19%) in the pediatric emergency unit. Of all the patients hospitalized, three patients (4.7%) were further admitted to intensive care. 29 patients (46%) resulting in discharge from the pediatric emergency unit.

At the emergency unit, the patients received salbutamol (77.8%), oxygen therapy (68.3%), inhaled steroids (63.5%), intravenous fluid therapy (50.8%), antibiotics (55.6%), systemic steroids (27%), ipratropium bromide (19%), multiple bronchodilators (salbutamol + ipratropium bromide 19%), multiple antibiotics (17.5%), 3% NaCl (12.7%), and intravenous magnesium sulfate (1.6%).

Table 3 summarizes the distribution of treatment methods and the need for hospitalization to the clinical and laboratory findings of the patients. The use of multiple bronchodilators was greater in patients with comorbidities, tachypnea, and pulmonary infiltration on chest X-rays ($p<0.05$). Inhaled steroids were more frequently administered in patients and those having comorbidities, tachypnea, hypoxemia ($p<0.05$) and systemic steroid treatments. The frequency of antibiotic administration increased in the presence of comorbid conditions, hypoxemia, tachypnea, and radiological infiltration. Patients with acidosis, hypoxemia, hypercarbia, tachypnea, comorbid conditions, prematurity, and radiographic infiltration had higher hospitalization rates ($p<0.05$).

Patients with comorbidities had higher rates of multiple bronchodilator treatment and hospitalization than those without comorbid conditions ($p<0.05$). The presence of tachypnea was associated with increased use of multiple bronchodilators, inhaled steroids, systemic steroids, intravenous fluid therapy, and antibiotics as well as a greater need for hospitalization ($p<0.05$). Similarly, the presence of infiltration on chest X-rays resulted in increased use of multiple bronchodilators, intravenous fluid therapy, and antibiotics and a greater need for hospitalization ($p<0.05$). The majority of hypoxemic patients (90.9%) received inhaled steroid treatment ($p<0.05$) (Table 3).

DISCUSSION

Treatment and hospitalization needs and durations of patients with bronchiolitis may vary depending on the severity and complications of the condition. The severity of the disease is linked to the causative agent, age, prematurity, and comorbid conditions as well as to clinical and laboratory findings. These factors can also be used for prophylaxis and to predict follow-up and treatment methods. Passive immunization against RSV

Table 3. Treatment methods and hospitalization needs of the patients about demographic, clinical, and laboratory findings

Demographic, clinical, and laboratory findings	Multiple inhaled bronchodilators (n=12, 19%)	Inhaled steroids (n=40, 63.5%)	Systemic steroids (n=17, 27%)	Intravenous fluid therapy (n=32, 50.8%)	Antibiotherapy (n=35, 55.6%)	Hospitalization (n=34, 54%)
Prematurity‡ (n=11, 17.5%)	3 (27.3%)	7 (63.6%)	3 (27.3%)	8 (72.7%)*	7 (63.6%)	9 (81.8%)*
Comorbidity § (n=17, 27%)	6 (35.3%) *	13 (76.5%)*	6 (35.3%)	13 (76.5%)*	13 (76.5%)*	14 (82.4%)†
Age <12 months (n=53, 84.1%)	10 (18.9%)	33 (62.3%) *	16 (30.2%)†	26 (49.1%)	27 (51%)	31 (58.5%)
Tachypnea (n=37, 58.7%)	11 (29.7%)†	33 (89.2%) †	15 (40.5%)*	29 (78.4%)*	26 (70.3%) *	31 (83.8%)†
Acidosis ∅ (n=6, 9.5%)	1 (16.7%)	3 (50%)	2 (33.3%)	4 (66.7%)	4 (66.7%)	6 (100%)*
Hypoxemia ¶ (n=22, 34.9%)	5 (22.7%)	20 (90.9%)†	7 (31.8%)	14 (63.6%)	16 (72.7%)*	16 (72.7%)*
Hypercarbia ∅ (n=6, 9.5%)	1 (16.7%)	3 (50%)	2 (33.3%)	3 (50%)	3 (50%)	5 (83.3%)*
Radiographic infiltration ** (n=40, 63.5%)	11 (27.5%)†	29 (72.5%)	13 (32.5%)	26 (65%) *	28 (70%) *	29 (72.5%) *

*: P<0.05 (Chi-square test), †: P<0.05 (Fisher's exact test), ‡: Births before the 38. gestational week. §: Congenital heart diseases, bronchopulmonary dysplasia, and other chronic lung diseases, malignancy/immunosuppression, central nervous system diseases, gastrointestinal diseases; ¶: SpO₂ <%95; ∅: Blood gases were measured in 50 patients (79.4%); **: Pulmonary infiltration on chest X-ray, (which was obtained in 58 (92.1%) patients.

is only considered for some risk groups due to its high cost (11). It is estimated that there are about 34 million episodes of RSV bronchiolitis annually, of which 3.4 million require hospitalization (12). In the United States, the incidence of RSV-related admissions between 1996 and 2006 was 26.0/1,000 for cases ≤ 12 months of age (48.9/1,000 for ≤ 3 months and 28.4/1,000 for 3-5 months of age) and 1.8/1,000 for cases >12 months of age (13). A total of 66,000 deaths occur annually secondary to RSV infections, with a significant proportion of mortalities occurring in infants younger than 2 years living in developing or underdeveloped countries (12). For 2004 and 2012, the annual mortality rates due to RSV bronchiolitis in Spain were reported as 120 and 69 in 100,000 cases, respectively (14). In cases of severe infections, the leading risk factors are congenital heart diseases, congenital pulmonary malformations, chronic pulmonary disease, and neuromuscular diseases. Additional risk factors for hospitalization are age less than 6 months, male gender, accompanying sibling at home, receiving care at day-time nurseries, and exposure to cigarette smoke (9,10,12). Prematurity (<35 gestational weeks), chronic pulmonary disease, and congenital heart disease causing hemodynamic instability have been implicated as the leading causes of morbidity and mortality from RSV infections (15,16). Neurologic deficits have also been shown among comorbid conditions that may be associated with mortality (17). In our series, there were 17 patients with comorbid conditions, with central nervous system disease being the most frequent (n=5), followed by chronic pulmonary disease (n=4) and congenital heart disease (n=4). There were no cases of peripheral nerve disorder (e.g. muscular disease).

The hospitalization rate was 54%, with three patients (4.7%) requiring intensive-care admission. The rates of cases requiring intensive care have been reported between 2-8% in the literature (5,6,18). The key element in the management of acute RSV bronchiolitis is supportive therapy. Hospitalized patients often require oxygen therapy in the acute setting of hypoxemia and intravenous fluid and electrolyte therapy to prevent or treat dehydration (19). Routine use of bronchodilators and systemic steroids are not recommended as they are often not effective (20-22).

Presentation of our cases with RSV infections falls between December and February. Clinical studies conducted in countries in the northern hemisphere, which also includes our country, have reported the seasonal emergence of RSV infections in the fall-winter and spring months, usually between October and May (23,24). Although the cause of this rise in the incidence of the disease during this period remains uncertain, it may be partly explained by the keeping of children indoors, particularly at school, increased hospital presentations, and increased air pollution (24,25).

Despite unproven efficacy, bronchodilator drugs are commonly used in the treatment of bronchiolitis, generally through inhalation, which includes salbutamol (albuterol), a beta-2 agonist; ipratropium bromide, an anticholinergic agent; and adrenaline, an alpha-adrenergic agonist (11,19-22,26). Although these bronchodilators provide early clinical improvement through dilation of the bronchial mucosa, their efficacy is of short duration and has been shown not to reduce hospital presentations, hospital stay, or disease duration (11,27). Taking into account their unproven efficacy



in bronchiolitis, the current recommendation for the use of these drugs is that they may be continued on an individual basis provided that positive effects are observed such as increased oxygen saturation and decreased respiratory problems (3,11,19,28). In our cases, salbutamol was used in 77.8% of the patients, and ipratropium bromide was used in 19%, always in combination with salbutamol.

Despite their transient efficacy and lack of conclusive data about their effectiveness, combined use of multiple bronchodilators may be necessary in cases with moderate-to-severe clinical conditions. This was the case in 19% of our cases, particularly in patients with tachypnea and/or infiltration on chest X-rays, suggesting the role of these conditions in decreased responsiveness to treatment, aggravation of the clinical course, and increased need for hospitalization.

Inhaled or parenteral steroids are commonly used in patients with bronchoconstriction (11,19,22,26). Although sufficient evidence is lacking in terms of their effectiveness on the rate and duration of hospitalization (22,29,30), they are mainly used for anti-inflammatory efficacy, especially in cases with underlying asthma/allergic conditions (22). In RSV bronchiolitis, the rate of systemic steroid use was reported as 19% (11). Inhaled (budesonide) and systemic (methylprednisolone) steroids were administered in 63.5% and 27% of cases, respectively. Of those younger than 12 months, 62.3% received inhaled, and 30.2% received systemic steroid treatment, suggesting that steroids were mainly added because of suspicion of asthma.

Inhalation of normal saline (0.9% NaCl) can be used in patients with bronchiolitis to increase mucus clearance (26), but this treatment option is not mentioned in some current guidelines and literature reviews (3,28). On the other hand, despite the lack of recommendations for routine use, hypertonic saline (3% NaCl) seems to be widely used in the treatment of bronchiolitis (26). Hypertonic saline may increase mucus clearance through the passage of excess water to the mucus layer (31), but it should be combined with a bronchodilator agent as it may cause bronchoconstriction (26,32,33). The guideline on the diagnosis, management, and prevention of bronchiolitis by the American Academy of Pediatrics recommends hypertonic saline only for hospitalized patients, but not for patients receiving care in the emergency department, as it is effective at improving symptoms after 24 hours of use (34,35). Thus, data on the use of hypertonic saline in outpatient and emergency settings are insufficient and inconclusive (32,36). Hypertonic saline was used in 12.7% of our cases.

Patients with bronchiolitis often develop fluid loss due to tachypnea, and accompanying fever also increases fluid requirement (26,37). In the presence

of inadequate or impaired oral intake, fluid therapy is recommended through a nasogastric/orogastric tube. However, parenteral fluid therapy may be more convenient in moderate-to-severe cases of bronchiolitis due to marked dyspnea and tachypnea (>60-70/min) to avoid or prevent aspiration (3,26,38). Intravenous fluid-electrolyte therapy was administered in 50.8% of our cases, being more frequent in the presence of tachypnea, comorbidity, prematurity, and infiltration on chest X-rays.

The frequency of secondary bacterial infections was found to be 1.2% in a large series of infants with severe RSV bronchiolitis (39). In contrast, about 25% of infants admitted with bronchiolitis were reported to have infiltration or atelectasis, which was initially considered to be a bacterial infection (40). There are few studies supporting the use of antibiotics in patients with bronchiolitis and its routine use is not recommended (26,41). Antibiotics may be required in the presence of suspected bacterial pneumonia, particularly in cases with infiltration, or for prophylaxis to prevent secondary bacterial infections (11). More than half of our cases (55.6%) received antibiotics possibly due to the severity of the clinical course and prolonged hospitalization due to comorbidities, hypoxemia, tachypnea, and infiltration on chest X-rays. Literature reports from several countries vary considerably concerning antibiotic rates in hospitalized patients without mechanical ventilation, 34% in New Zealand (42), 45% in the UK (43), and 45% in the US. A prospective multicenter study from France even reported an antibiotherapy rate of 53% for cases receiving ambulatory management (45).

Routine antibiotic use has been recognized in guidelines as having little benefit. But in one review, roughly half of the children, both inpatients, and outpatients, are reported to be commonly prescribed antibiotics (46).

Intravenous magnesium sulfate is used at our center for bronchiolitis in cases with bronchoconstriction resistant to other treatments, which was the case in 1.6% of the patients in the present study. Delivered intramuscularly or by inhalation, magnesium sulfate acts as a muscle relaxant through calcium blockage on respiratory muscles, resulting in bronchodilation. However, it should be delivered slowly during a 20-minute infusion as it may be associated with hypotension (47). A randomized study of 162 previously healthy infants with bronchiolitis whose ages ranged between 22 days and 17.6 months (median, 3.7 months) found no superiority of magnesium sulfate (n=78) over placebo (n=82) in terms of the severity score of bronchiolitis and hospital stay (48). Of note, current guidelines for the treatment of bronchiolitis include no recommendation for the use of magnesium sulfate (3,34).

Limitations of the Study

Due to the retrospective design of the present study from a single center, small sample size, inability to access information about whether patients are vaccinated with palivizumab for immunoprophylaxis, the lack of clinical staging of disease severity, and the small size of patients requiring ventilation treatment, it was not possible to obtain reliable data for correlations between the treatment modalities and the severity of bronchiolitis (mild, moderate, or severe). Instead of the immunochromatographic assay, which is the preferred technique at our pediatric emergency department due to the advantages of lower cost and rapid results, more sensitive molecular techniques could have been used, which would have avoided false negatives and allowed virological diagnoses to be made. Unfortunately, these methods are not expected to be routinely used in emergency departments until they are less costly and provide rapid results.

CONCLUSION

As a symptom, the respiratory rate may help predict the need for multiple bronchodilators, steroid treatment, and antibiotic use for the treatment of bronchiolitis, as well as the need for longer observation/treatment or hospitalization. The presence of comorbid conditions and tachypnea seems to play a critical role in determining treatment needs. In addition, the presence of infiltration on chest X-rays is also indicative of treatment needs and hospitalization.

ETHICAL DECLARATIONS

Ethics Committee Approval: The present study protocol was reviewed and approved by the Marmara University Faculty of Medicine Clinical Research Ethics Committee (approval No. 09.2017.389).

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

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