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ORIGINAL ARTICLE

The clinical experience of croup at a tertiary care center in Jeddah, Western Saudi Arabia

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ABSTRACT

Background: Viral croup is an upper respiratory tract inflammation that commonly affects children. This paper reports the prevalence, clinical characteristics, outcomes, and management of patients with croup who presented to the emergency department (ED) of a tertiary care center in Jeddah, Saudi Arabia.

Methods: A retrospective study was conducted using the hospital's electronic medical records of pediatric patients with croup aged 0-14 who presented to the ED between July 1, 2016, and December 30, 2022. A data collection sheet containing four sections–demographics, clinical manifestations, assessment, and management–was used. Statistical analysis was conducted using JMP statistical software version 15.2.0.

Results: A total of 146 patients were included, among which, 74 (50.68%) were under 2 years of age, and approximately half of the patients presented to the emergency department during autumn. Cough was the most common clinical manifestation, reported in 134 patients (91.78%). Regarding the Westley score, a mild grade was reported in 25 (58.14%) patients. Abnormal chest and neck radiographs were observed in 38 (60.32%) and 21 patients (65.63%). Regarding management, dexamethasone was administered to 131 (89.73%) patients. Moreover, only 15 (10.27%) patients were hospitalized, and the rest were discharged from the ED.

Conclusion: The study found that approximately half of the total emergency visits for croup cases occurred during autumn, with most patients under 2 years old. The most common clinical symptom noted in these patients was cough. Dexamethasone was administered to most patients; interestingly, most patients did not require hospitalization.

Keywords: Viral croup, respiratory condition, pediatric emergency department, respiratory distress.

Introduction

Croup is one of the most common respiratory conditions in the pediatric age group [1]. This is frequently observed in children aged 6-36 months [2]. It is commonly caused by parainfluenza types 1 and 3 viruses, accounting for 75% of all cases. Influenza A and B, respiratory syncytial virus, rhinovirus, adenovirus, and enterovirus are possible croup etiologies [3,4]. Characteristically, patients with croup present with stridor, barking cough, and hoarseness, with most presenting with the mild form. Furthermore, symptoms occasionally worsen at night, depending on the child's agitation [3]. Typically, patients present with a short-term onset of symptoms, ranging from 3 to 7 days, and in 60% of children, the barking cough is reported to resolve within 48 hours [3]. However, severe airway obstruction, distress, and even death can occur [3]. Airway inflammation, submucosal edema, and narrowing of the subglottic area are associated with the clinical characteristics of croup [5].

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Croups account for many pediatric emergency department (ED) visits. In Canada, for example, croup was reported in 3.2%-5.1% of all ED visits in children aged <24 months [6]. Suitable management approaches can be developed once proper assessments and clinical diagnoses have been made. Thus, various scoring scales are available to classify the severity of the condition. The Westley Croup Scale is the most utilized in EDs, which assesses mental status, presence or absence of stridor, pallor or cyanosis, air entry, and chest wall retractions. Thus, the severity grade was determined based on the sum of the results [4].

On an emergency visit, if the patient is hypoxemic or in respiratory distress, oxygen must be administered in addition to corticosteroids, as it is considered beneficial and safe for improving symptoms and decreasing the need for endotracheal intubation [4]. Guidelines recommend that dexamethasone be administered in all severe forms of croup [7]. It has been shown that after 6 to 12 hours of steroid administration, the severity score, length of stay in the ER, and revisits are reduced [7]. Various administration routes are available, such as oral, intramuscular, or intravenous routes; however, the oral route is preferred owing to its noninvasive nature [8,9]. Furthermore, budesonide is administered as a nebulizer; nevertheless, the combination of budesonide and dexamethasone did not provide additional benefits for croup [10,11]. Significantly, epinephrine has shown improvement in symptoms; however, due to its short duration of action, it did not reduce rates of hospitalization periods or the incidence of tracheostomies [12]. Instead, it is recommended to combine epinephrine with corticosteroids for moderate and severe forms of croup, as epinephrine has been shown to control symptoms and decrease airway edema effectively [11].

Although clinical guidelines are available, published studies have reported low compliance with guidelines and variations in practice concerning the type of steroid administered, dosage, and route of administration for croup [13,14]. Therefore, this study aimed to report and present the prevalence, clinical characteristics, outcomes, and management of croup in patients who presented to the ED of a tertiary care center in Jeddah, Saudi Arabia. Thus, it gave insight and highlighted the clinical adherence to proper management and outcomes and shared the experience of a tertiary care center.

Materials and Methods

Study settings and design

This retrospective study was conducted using a data collection sheet and the hospital's electronic records to retrieve and collect the required data for patients who presented to the ED at King Abdulaziz Medical City (KAMC), Jeddah, Saudi Arabia. It is a tertiary care center in which the ED consists of 45 beds with 90,000-120,000 visits annually.

Data collection process

The first section of the data collection sheet was designed to obtain patients' demographic data, which included age at presentation, current age, month of presentation, and sex.

The second section of the data collection sheet was dedicated to patients' clinical manifestations and physical examination findings. Moreover, the clinical manifestation part was designed as a "Yes" and "No" checklist regarding the patient's clinical presentation in the ED (including dyspnea, cough, sore throat, fever, nausea, vomiting, abdominal pain, diarrhea, and constipation). The physical examination section included questions specifically related to the auscultation findings.

The third section covered ED assessment and management. This section inquired about whether patients received corticosteroids in the ED and their route of administration. The radiological findings of the patients were discussed in this section.

The final section of the data-collection sheet contained information on whether the patient received further assessments upon hospitalization and the patient's Westley Croup score.

Identification of study participants

The inclusion criteria for this study were pediatric patients aged 0-14 years presenting to the ED with croup between July 1, 2016, and December 30, 2022.

Statistical analysis

Categorical variables were reported as frequencies and percentages. Statistical analyses were performed using JMP Statistical Software version 15.2.0 (SAS Institute, Cary, NC, a subsidiary of the SAS Institute).

Results

A total of 146 patients were included in this study. Seventy-four (50.68%) patients were <2 years old. Of these patients, 105 (71.92%) were male. Approximately half (69, 47.26%) of the patients with croup presented to the emergency department during autumn, Table 1.

The most common clinical manifestation was cough (134 patients, 91.78%), followed by dyspnea (62, 42.47%) and fever (84, 57.53%). Upon clinical and physical examination, 69 (47.26%) patients had stridor, and 14 (9.58%) had decreased air entry. A total of 122 (83.56%) patients did not present with costal retractions; in contrast, 20 (13.70%) presented with mild retractions. Of those with documentation of the Westley score, 25 (58.14%) scored mild, 13 (30.23%) scored moderate, and five (11.63%) scored severe (Table 1).

Chest radiography was performed in 63 (42.15%) patients, and soft tissue neck radiography was performed in 32 (21.92%) patients; abnormal findings were observed in 38 (60.32%) and 21 (65.63%) patients, respectively (Table 2).

Dexamethasone was administered to 131 (89.73%) patients. Of the patients who had documented the route of dexamethasone administration, 72 (56.69%) received the dose orally, 46 (36.22%) received it intravenously, and 9 (7.08%) received it intramuscularly. In addition, 11

Table 1. *Demographics.*

Item	*N* (%)
Gender	
• Male	105 (71.92%)
• Female	41 (28.08%)
Age at presentations	
• <2 years	74 (50.68%)
• 2-4 years	51 (34.93%)
• ≥5 years	21 (14.38%)
Current age	
• <2 years	14 (9.589%)
• 2-4 years	32 (21.92%)
• 5-8 years	73 (50.00%)
• ≥9 years	27 (18.49%)
Season of presentation	
• Autumn	69 (47.26%)
• Winter	33 (22.60%)
• Summer	25 (17.12%)
• Spring	19 (13.01%)
Clinical and physical findings	
Decreased air entry	
• Yes	14 (9.589%)
• No	132 (90.41%)
Stridor	
• Yes	69 (47.26%)
• No	77 (52.74%)
Wheezing	
• Yes	15 (10.27%)
• No	131 (89.73%)
Retractions	
• None	122 (83.56%)
• Mild	20 (13.70%)
• Moderate	3 (2.055%)
• Severe	1 (0.685%)
Clinical manifestations (Put values only for Yes answers)	
• Cough	134 (91.78%)
• Dyspnea	62 (42.47%)
• Fever	84 (57.53%)
• Vomiting	41 (28.08%)
• Runny nose	20 (13.70%)
• Sore throat	9 (6.164%)
• Decreased oral intake	9 (6.164%)
• Diarrhea	4 (2.740%)
• Constipation	1 (0.685%)
• Abdominal pain	1 (0.685%)

(8.33%) patients required a repeat dose. Fifteen (10.27%) patients required hospitalization, and eight (53.33%) had a stay of 1-2 days. Of those who were hospitalized, four (26.67%) were admitted to the NICC/PICU (Table 2).

Discussion

This study described the prevalence, clinical characteristics, prognosis, and croup treatments in young patients who visited an emergency room in a tertiary care center in Jeddah, Saudi Arabia.

Males (70%) are more commonly affected than females (30%), according to a study done in King Abdullah Specialized Children's Hospital, and the mean age of the participants was 25 ± 22 months, the frequently affected age group. Dexamethasone was administered to 67% of the patients [2]. According to our findings, croup predominantly affected males 105 (71.92%), and most patients [74 (50.68%)] were aged <2 years.

In a study conducted for over 40 months, 233 patients were assessed. Coughing was reported to have good sensitivity and specificity in 102 croup cases [15].

Table 2. *Clinical characteristics.*

Item	Values, *N* (%)
Chest X-ray	
• Abnormal findings	38 (26.03%)
• Normal findings	25 (17.12%)
• Not performed	83 (56.85%)
Neck X-ray	
• Abnormal findings	21 (14.38%)
• Normal findings	11 (7.534%)
• Not performed	114 (78.08%)
Culture	
• Positive	10 (6.849%)
• Negative	13 (8.904%)
• No performed	146 (84.25%)
Corticosteroid	
Dexamethasone	131 (89.73%)
Route of administration	
• Oral	72 (56.69%)
• Intravenous	46 (36.22%)
• Intramuscular	9 (7.086%)
Prednisolone	1 (0.685%)
Route of administration	
• Oral	1 (100.0%)
Required a repeated dose	
• Yes	11 (8.33%)
• No	121 (91.667%)
Acetaminophen	51 (34.93%)
Ibuprofen	11 (7.534%)
Hospitalized	
• Yes	15 (10.27%)
• No	131 (89.73%)
Length of stay	
• 1-2 days	8 (53.33%)
• 3-4 days	3 (20.00%)
• ≥5 days	4 (26.67%)
NICU\PICU admission	
• Yes	4 (2.740%)
• No	142 (97.26%)
Length of stay	
• 1 day	2 (50.00%)
• 2 days	2 (50.00%)
Outcomes	
• Discharged from ER	130 (89.04%)
• Discharged after admission	15 (10.27%)
• Signed DAMA	1 (0.685%)
Westly score	
• Mild	25 (58.14%)
• Moderate	13 (30.23%)
• Severe	5 (11.63%)

Similarly, in our study, cough was the most common clinical manifestation, 134 (91.78%).

In the national ED databases, autumn was the season with the highest occurrence of croup cases (October = 13.7%); 75.1% of the patients received steroids, and 3.0% of cases required hospital admission [16]. In contrast, approximately half [69 (47.26%)] of thepatients with croup presented to the KAMC-ER during autumn.

Regarding management, 131 (89.73%) patients received dexamethasone, and 10.27% were hospitalized, demonstrating the efficacy of dexamethasone in treating and reducing the need for hospitalization of patients with croup. Furthermore, this is consistent with the results of a systematic review that highlighted that administering dexamethasone and other steroids to patients with croup

reduces the need for hospitalization and readmission [16]. This is also supported by a study published by the American Academy of Family Physicians, which claims that administering corticosteroids, such as dexamethasone, to croup patients, regardless of severity, results in shorter recovery time and lower readmission rates [17].

Limitations and Recommendations

This study had some limitations. For example, it represented a limited population because it was a single-center study with a small sample size. Nevertheless, this study highlighted the clinical characteristics of patients with croup and the experience of a tertiary care center in managing such cases. Therefore, further multicenter studies with larger sample sizes can contribute to a more precise and appropriate representation of croup and offer a more representative and accurate presentation of the overall population.

Conclusion

In conclusion, this study found that approximately half of the total croup cases occurred during autumn, with most patients under 2 years of age. The most common clinical symptom noted in these patients was cough. Dexamethasone was administered to 89.73% of the patients, and interestingly, this same percentage of patients did not require hospitalization. This suggests that dexamethasone effectively managed croup symptoms and reduced the need for hospitalization at our tertiary care center.

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List of Abbreviations
ED Emergency department

Conflict of interest
The authors declare that there is no conflict of interest regarding the publication of this study.

Funding
None.

Consent to participate
A waiver of informed consent by KAIMRC was considered for this study due to the retrospective study design.

Consent for publication
Not applicable.

Ethics approval
Ethical approval was granted by the Institutional Review Board at King Abdullah International Medical Research Centre (KAIMRC), Jeddah, Saudi Arabia via reference number JED-23-427780-14169, date: 24 January 2023.

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