

## Presentation of Kerosene Pneumonia and the Role of Corticosteroids in Its Management

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### Abstract

**Objective:** Accidental kerosene pneumonia is common form of acute childhood poisoning. Corticosteroid is used for treatment of kerosene pneumonia. This study has been conducted to clarify the presentation of kerosene pneumonia and the role of corticosteroid in its management.

**Methods:** One hundred twenty two children with kerosene poisoning admitted to kerbala teaching hospital for children from January 2006 to January 2008. (Two patients were excluded from the study because they died within few hours after arrival, one due to deep coma and the other due to severe abdominal distention and bleeding per rectum). Sixty patients were chosen for corticosteroid therapy and 60 patients were taken as a control group. Symptoms and signs were recorded; chest x-ray, leukocyte counts and erythrocyte sedimentation rate also obtained at first, third, fifth, eighth and twelfth days of admission

**Results:** Of the 120 admitted children, 71(59.2%) were boys and 49(40.8%) were girls, with ages ranging from 6 months to 6 years .The largest group, (48.4%), were admitted during the summer months .The most commonly observed symptoms were tachypnea (66.6%), fever (58.3%), cough (54.1%) ,vomiting (45.9%), 18% of the patients showed signs of central nervous system (CNS) impairment, including drowsiness, restlessness, and stupor.

There was no difference between the two groups who were treated with corticosteroid and those without corticosteroid regarding the clinical course, duration of illness, fever, respiratory rate, heart rate, leukocyte counts, Erythrocyte Sedimentation Rate, and changes in x-ray findings

**Conclusions:** There is a higher risk of hydrocarbon poisoning during the hot months of the year; the respiratory system is the main target organ affected, vomiting after hydrocarbon ingestion is related to the rate of development of pneumonia; symptoms of central nervous system impairment were correlated with pneumonia, and fever. Corticosteroids are ineffective in altering the acute course of hydrocarbon pneumonia, shortening the duration of the disease, alleviation of symptoms and signs or prevention of complications.

### الخلاصة

**تمهيد:** تناول النفط الأبيض يعد من أهم أسباب حالات التسمم الحاد عند الأطفال في اغلب الدول النامية لان النفط الأبيض يحفظ في متناول اليد ويستخدم للطبخ والإضاءة والتدفئة. و في أغلب الأحيان يخزن ضمن منطقة السكن مما يشكل عامل خطورة على الأطفال. إن أخطر مضاعفات تناول النفط الأبيض هي استنشاق غاز النفط وما ينتج عنه من التهاب رئوي حاد. هنالك أعضاء أخرى ممكن إن تتأثر كالجهاز العصبي المركزي والكبد و القلب. الكورتيكوستيرويد تستعمل لعلاج الالتهاب الرئوي الناتج من تناول النفط الأبيض.

**الهدف من الدراسة:** أجريت هذه الدراسة في مستشفى كربلاء التعليمي للأطفال من كانون الثاني ٢٠٠٦ إلى كانون الثاني ٢٠٠٨ لمعرفة أعراض حالات التسمم وتأثير الكورتكوستيرويد في علاج الالتهاب الرئوي الناتج من تناول النفط الأبيض.

**المواد وطرق العمل:** مائة واثنان وعشرون طفلاً أدخلوا بالتعاقب إلى مستشفى كربلاء للأطفال سجلوا في هذه الدراسة. اثنان منهم استثنوا من البحث لأنهم توفوا بعد ساعات قليلة من وصولهم إلى المستشفى احدثهم بسبب غيبوبة وتوقف التنفس والثاني بسبب نزيف حاد في الجهاز الهضمي.

**النتائج والمناقشة:** صنف الأطفال إلى مجموعتين ٦٠ طفلاً عولجوا بالكساميثازون 0.3 ملغرام/ كغم من وزن الجسم مقسم إلى جرعتين و ٦٠ طفلاً لم يستلموا دكساميثازول. شدة الأعراض و العمر و الجنس و الحالة الصحية العامة و شدة الالتهاب من خلال أشعة الصدر أخذت بالاعتبار خلال توزيع المرضى من أجل التشابه في الحالة المرضية. الأعراض والعلامات دونت بدقة في اليوم الأول و الثالث والخامس و الثامن و الثاني عشر بعد دخول المريض إلى المستشفى وكذلك أجريت لهم فحوصات عدد كريات الدم البيضاء و ESR وأشعة الصدر أيضاً في اليوم الأول والثالث والخامس و الثامن و الثاني عشر (للمرضى الراقدين فقط). الالتهاب الرئوي أهم نتائج تناول النفط الأبيض مع الحمى و لتقيؤ و سرعة التنفس وفقدان الوعي. خمسة مرضى أخرجوا من المستشفى في اليوم الثالث و مائه و واحد مريض أخرجوا من المستشفى بعد خمسة أيام وتسعة مرضى أخرجوا من المستشفى في اليوم الثامن وثلاثة مرضى في اليوم العاشر واثنان في اليوم الثاني عشر (بعد اكتساب الشفاء) ولم تظهر الدراسة إي تأثير للكورتكوستيرويد على سير المرض من ناحية الأعراض والعلامات والنتائج المخبرية ولا في شدة الالتهاب من خلال أشعة الصدر.

Keywords: Kerosene pneumonitis, Dexamethazone,

## Introduction

Accidental Kerosene ingestion continues to cause morbidity & mortality in third world countries, where kerosene is still used for cooking, cleaning and heating<sup>(1)</sup>. Kerosene poisoning is the most common chemical poisoning in Iraq<sup>(2)</sup>. Aspiration pneumonia is the most frequent complication of kerosene poisoning<sup>(3, 4)</sup>. It usually occurs at time of ingestion where coughing and gagging are common but can be secondary to vomiting that commonly occur after ingestion<sup>(5)</sup>. Hydrocarbon with high volatility, decreased viscosity and lower surface tension (kerosene, benzene, gasoline) are more likely to be aspirated and spread over a large area of lung tissue and subsequently result in severe respiratory injury<sup>(6)</sup>. It has been reported, however, that most children drink less than 30 ml of kerosene<sup>(7)</sup>. Ingestion of more than 30 mL (approximate volume of an adult swallow) of hydrocarbon is associated with an increased risk of severe

pneumonia<sup>(8)</sup>. Cardiac dysrhythmias may occur and may be exacerbated by hypoxia and acid-base or electrolyte disturbances<sup>(3, 4, 9)</sup>, kerosene have anesthetic properties and can cause transient CNS depression<sup>(10)</sup>. Gastric emptying is contraindicated because of further risk of aspiration. If gastric emptying is utilized, it must be done cautiously to avoid aspiration<sup>(11, 12)</sup>.

Respiratory symptoms sometimes ensue within minutes of the ingestion. It almost always begins within 6 hours, children who are asymptomatic after 6 hours are likely to remain so<sup>(5, 7)</sup>. Chest x-ray should be ordered to all patients because some asymptomatic children manifest radiographic abnormalities<sup>(7)</sup>. For those patients with abnormal findings, oxygen therapy is necessary to correct hypoxemia. Endotracheal intubation and mechanical ventilation are often necessary for more severe cases<sup>(12, 13, 14)</sup>. Bronchodilators may be given, although they are usually of limited benefit. As a general rule, prophylactic antibiotics are not indicated<sup>(12)</sup>. However, risk-benefit must be assessed and, in the patient with very limited reserve, antibiotic

coverage, especially for mixed anaerobes, may be appropriate<sup>(12, 15)</sup>. Some doctors advocate giving corticosteroids in the management of kerosene pneumonia.

The aim of the study is to evaluate children with kerosene ingestion admitted to Kerbala teaching hospital for children and to evaluate the role of corticosteroids in their management.

## Patients and Methods

One hundred twenty two children with kerosene poisoning admitted to Kerbala teaching hospital for children over two years (from January 2006 – January 2008) were studied. (Two patients were excluded from the study because they died within hours after arrival one due to deep coma and the other due to severe abdominal distention and bleeding per rectum). For each patient a data sheet was filled in including, sex, age, residence and season. Gastrointestinal manifestations (vomiting, abdominal pain, diarrhea, constipation & gastric dilatation), cough, cyanosis, somnolence, nutritional status, temperature, respiratory rate, heart rate and chest indrawing.

The patients were examined thoroughly including chest, abdomen & nervous system. All patients sent for chest x-ray, complete blood picture and erythrocyte sedimentation rate at day 1, 3, 5 and at any time when indicated. Two groups of patients were selected (60 patients each) with similarity of signs and symptoms, chest x-ray finding and laboratory investigations. For the first group Corticosteroid (Dexamethazone 0.3 mg/kg/day in 2 divided dose for 5 days) were given while the second group (control group) continued with conventional management (without corticosteroids) after taken informed consents from their families.

## Results

The ages of patients were ranging from 6 months to 6 years, 86.6 percent of the patients were 3 years and younger, (59.2%) were boys and (40.8%) were girls. (92%) were well nourished and (8%) were malnourished, (56%) of patients were from rural areas, (44%) were from urban areas. Commonly observed signs and symptoms were as shown in table 1. Eight patients (6.7%) show dullness on chest percussion (4.2%) on the right side and (2.5%) on the left side. By chest auscultation there is poor air entry on the right side in 5 patients (4.2%) and on the left side in 3 patients (2.5). The result of leukocyte count is depicted in table 2. The highest erythrocyte sedimentation rate was 75mm/h in two patients with pneumonia and pleural effusion; the results of erythrocyte sedimentation rate with kerosene poisoning were mentioned in table 3. Chest x-ray results during the first 24 hours were shown in table 4. Severe gastric dilatation developed in 4 severely affected patients; one of them died within few hours and was excluded from the study. Gastro-intestinal manifestations include abdominal pain in 55 patients (45.8%), constipation in 12 patients (10%), diarrhea in 9 patients (7.5%) and bowel motion was normal in 44 patients (36.7%). The percents of patients admitted in winter, spring, summer, and autumn were 10.1%, 18, 2%, 48.4%, and 23.3% respectively.

Signs of improvement in the studied patients are (subsidence of fever, return of heart rate and respiratory rate to normal for age and normalization of leukocyte count to normal for age)

Regarding the corticosteroid group: two patients improved by the 3<sup>rd</sup> day of admission, 51 improved by the 5<sup>th</sup> day, while four patients improved by the 8<sup>th</sup>,

and two patients improved by the 10<sup>th</sup> day, one patient improved by the 12<sup>th</sup> days, in the control group, three patients improved by the 3<sup>rd</sup> day of admission, 50 patients improved by the

5<sup>th</sup> day, while five patients improved by the 8<sup>th</sup>, and one patient improved by the 10<sup>th</sup> day, one patient improved by the 12<sup>th</sup> days.

Table 1. Clinical features of 120 children with kerosene pneumonia admitted to the hospital

Symptoms & Signs	Numbers	(%)
Tachypnea	80	66.6
Fever	70	58.3
Cough	65	54.1
Vomiting	55	45.9
Abdominal pain	55	45.8
Chest indrawing	42	35
Constipation	12	10
Somnolence	11	9.2
Diarrhea	9	7.5
Dullness on percussion	7	5.8
Cyanosis	5	4.1
Gastric dilatation	3	2.5

Table 2. Leukocyte count of 120 children with kerosene pneumonia admitted to the hospital (normal leukocyte count for the age group between 6 months -6 years is from 6-15 thousands/mm<sup>3</sup>)

Leukocyte counts	Numbers	(%)
Leukocyte count >15 thousands	20	17.2
Leukocyte count <15 thousands	99	82.8

Table 3. Erythrocyte Sedimentation Rate (ESR) of 120 children with kerosene pneumonia admitted to the hospital

ESR results	Numbers	(%)
ESR less than 20 mm/h	24	20
ESR between 21-35 mm/h	26	21.7
ESR between 36-50 mm/h	47	39.2
ESR between 51-65mm/h	20	16.6
ESR 66-75mm/h	3	2.5

Table 4. Chest x- ray findings of 120 patients, in the first 24 hr after ingestion of kerosene

Chest x-ray finding	Numbers	(%)
bilateral perihilar infiltration	92	76.7
Right side lower lobe Pneumonia	13	10.8
pleural effusion	8	6.7
Left side lower lobe pneumonia.	7	5.8

## Discussion

In the present study, patients were predominantly boys ((59.2%) (Male / Female ratio was 1.45), and

86.6 % of total patients were less than 3 years, these data are similar to those found in other studies, <sup>(2) (26) (28)</sup>. Sixty eight patients (56.7%) were from rural areas, fifty two patients (43.3%) were from urban areas, which could be due

to overuse of kerosene in rural area for cooking, lightening and heating as well

as improper storage and lack of parental supervision<sup>(26) (28)</sup>.

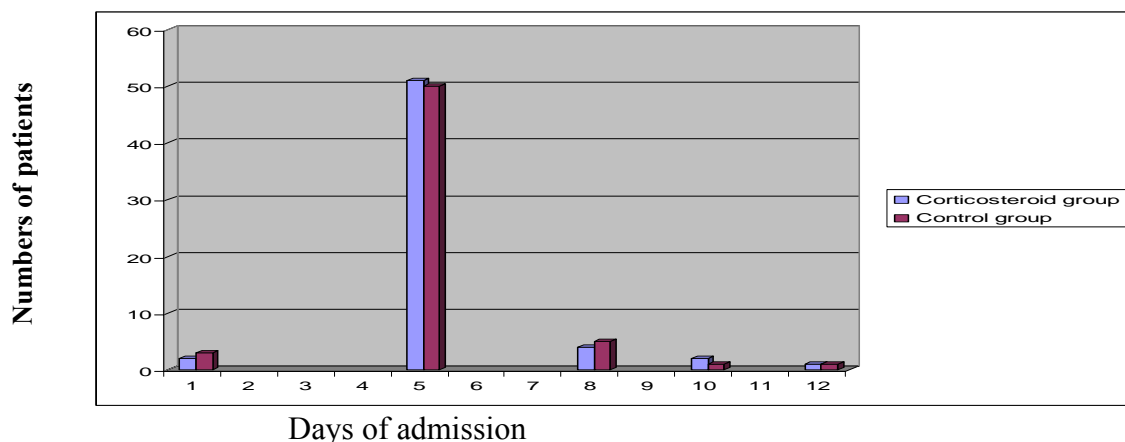


Figure 1. Comparison between the number of patients in the corticosteroid group and the control group and their days of admission

Our study indicates significant number of cases of kerosene poisoning occurred in summer (48.4%). marked seasonal predilection for summer could be attributed to kerosene being mistaken for water or other cold drinks, this result is in line with other studies<sup>(2, 18, 21, 22)</sup>

We found a high prevalence of symptoms relating to the respiratory system, tachyepa (66.6%), cough (54.1%) and chest indrawing (42%) followed by gastrointestinal and central nervous system manifestations. Fifty eight patients had fever (38°C or greater). These findings are similar to other studies<sup>(2, 19, 22, 23, and 29)</sup>

Vomiting after ingestion of kerosene occurred in (45.9%) of our patients and was significantly correlated with pneumonia. This result is similar to Press E et al,<sup>(30)</sup>

Leukocytosis is an indication of pneumonia, (20.2%) of our patients showed leukocyte count more than 15 thousands. While (80%) of them showed ESR more than 20 mm/hour, and the highest Erythrocyte Sedimentation Rate was 75 mm/hour for two patients

Pulmonary radiological changes were seen in (82.5%) of our patients and the

abnormalities were shown in table 4 which is similar to some extent to the findings of( Annobil SH) in 1991<sup>(31)</sup> who reported pulmonary radiological abnormalities in 71.2% of his series and the two most common findings were bilateral perihilar infiltrates with clear lung bases and bilateral perihilar with basal infiltrates with few cases of empyema, pneumomediastinum and surgical emphysema, the last three finding are not seen in our study.

Medical care was mainly supportive. Patients received antipyretics, and humidified oxygen when necessary. Antibiotics were prescribed for all patients admitted to the hospital.

Regarding the corticosteroid group: two patients improved by the 3<sup>rd</sup> day of admission, 51 improved by the 5<sup>th</sup> day, while four patients improved by the 8<sup>th</sup>, and two patients improved by the 10<sup>th</sup> day, one patient improved by the 12<sup>th</sup> days. In the control group, three patients improved by the 3<sup>rd</sup> day of admission, 50 patients improved by the 5<sup>th</sup> day, while five patients improved by the 8<sup>th</sup>, and one patient improved by the 10<sup>th</sup> day, one patient improved by the 12<sup>th</sup> days.

This study showed that corticosteroid therapy dose not shorten the duration

of illness and there is no differences between the corticosteroid group and control group regarding duration of fever, respiratory symptoms, (tachypnea, cough and chest indrawing), Erythrocyte Sedimentation Rate, white blood cells count and chest x-ray findings, so administration of corticosteroids does not appear to be useful in treating kerosene pneumonia regarding shortening the duration of the disease, alleviation of symptoms and signs or prevention of complications. In fact, corticosteroid may suppress the immune response and may promote bacterial infection. Our study is in agreement with results that indicate corticosteroid is not an effective treatment for kerosene-induced pneumonia<sup>(8,9,16-18)</sup>

## Conclusions

- There is a higher risk of hydrocarbon poisoning during the hot months of the year.
- Vomiting after hydrocarbon ingestion is related to the rate of development of pneumonia.
- Corticosteroid is not useful in treatment of hydrocarbon pneumonia

## Recommendations

Accidental hydrocarbon poisoning continues to be a major problem in children and is prevalent mostly due to overuse of kerosene. So the incidence of kerosene poisoning can be decreased by;

1. Availability of electricity,
2. Proper parental supervision
3. Storage of kerosene away of reach of children.

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