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Original article

Characteristics of Kerosene Poisoning in Children in Kirkuk City

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Abstract:

- ***Background*:** Kerosene poisoning is a common accidental poisoning in children in developing countries, largely due to its domestic use and unsafe storage. Its low viscosity, high volatility, and low surface tension increase the risk of aspiration pneumonitis following ingestion. This study aims to identify the demographics, clinical signs, radiological findings, and treatment outcomes of kerosene poisoning in children in Kirkuk City.
- ***Methods:*** Seventy-two children with kerosene ingestion were admitted to emergency departments in Kirkuk pediatric hospitals between June 1, 2020, and June 1, 2021. Data were collected through a structured questionnaire completed by parents, covering age, sex, residence, time and amount of ingestion, storage method, symptoms, and radiological findings. Patients' ages ranged from 10 months to 10 years, with 54 boys (75%) and 18 girls (25%).
- ***Result:*** Most cases (75%) involved boys, with the highest frequency in children under three years of age. Kerosene poisoning occurred more often during the summer. The most common symptom was coughing within the first six hours. Aspiration pneumonitis was typically mild to moderate, and no deaths were reported. Vomiting, particularly when induced, was significantly associated with the development of pneumonitis.
- ***Conclusions:*** Kerosene poisoning in Kirkuk City is predominantly a seasonal and age-related issue, affecting young boys during warmer months. Although cases are generally mild, radiological imaging is critical in evaluating pneumonitis, as clinical signs alone may be misleading. Educating caregivers about safe storage and the risk of inducing vomiting is essential to reduce complications.
- **Keywords:** Kerosene poisoning, children, Kirkuk

INTRODUCTION

Kerosene is a straight-chain aliphatic hydrocarbon widely used in households and industries, particularly in rural areas of developing countries such as Iraq. It serves multiple purposes, including cooking, lighting, heating, and as a component in paints and pesticides. Unfortunately, its presence in domestic settings, often stored in soft drink or beverage bottles with colorful packaging, makes it easily accessible to children and increases the risk of accidental ingestion (1,2).

Kerosene poisoning in children remains a significant and preventable cause of morbidity and mortality. Preventive strategies such as safe storage practices, community education, providing alternative energy sources like electricity in rural areas, and promoting the use of gas instead of kerosene stoves can greatly reduce the incidence of these cases (1,2). Studies report that kerosene poisoning accounts for 14–60% of hospital admissions due to accidental poisoning in children (5).

Once aspirated, kerosene spreads quickly across the respiratory tract, affecting the airway and alveoli. It inactivates type II pneumocytes, leading to surfactant deficiency, intra-alveolar hemorrhage, inflammation, and tissue necrosis (1,6). Most of these poisonings are unintentional and predominantly affect male children under the age of five (1,3). Chest radiographs may remain abnormal long after clinical improvement, and complications such

as pneumatoceles may appear two to three weeks following exposure (6,7). There is currently no established role for corticosteroids or prophylactic antibiotics in treatment (6,8).

Given the preventable nature of kerosene poisoning, emphasis should be placed on household safety measures. Kerosene containers should be clearly labeled with the word "poison," and its storage in drink bottles must be avoided. Community-based education and safer cooking alternatives are essential in reducing these incidents (1,2,4,8). This study aimed to investigate the demographics, clinical presentation, radiological features, and treatment of kerosene poisoning in children in our locality.

PATIENT and METHOD

This study included 72 children who were admitted immediately to the emergency departments of Kirkuk pediatric hospitals following kerosene ingestion between June 1, 2020, and June 1, 2021. Among them, 54 (75%) were boys and 18 (25%) were girls, with ages ranging from 10 months to 10 years.

Clinical history was obtained from the parents using a structured questionnaire (see Appendix), which collected information on the child's name, age, sex, residence, date of admission, mother's occupation, season, time and estimated amount of ingestion, method

and location of kerosene storage, clinical presentation, occurrence and timing of vomiting (spontaneous or induced).

Although the exact amount of kerosene ingested could not be measured, a history suggesting ingestion of a large quantity was associated with more severe clinical outcomes.

Each patient underwent a thorough physical examination upon admission, assessing level of consciousness, awareness, pulse rate, respiratory rate, oxygen saturation, body temperature, and inspection of the skin, mouth, and pharynx. Chest and abdominal examinations were also performed. All patients remained under observation in the emergency department for a minimum of six hours post-ingestion.

Chest radiographs were obtained for all patients six hours after ingestion, and a complete blood count (CBC) was performed. Fifty-one patients required admission to the pediatric ward due to abnormal clinical findings or radiographic abnormalities. Those admitted were managed with oxygen therapy, antibiotics, and supportive care. All admitted patients were successfully discharged within 3 to 7 days.

RESULTS

The ages of the patients ranged from 10 months to 10 years. The majority of cases—60 patients (83.3%)—were between 1 and 4 years of age, while 12 patients (16.6%) were older than 4 years, as presented in Table 1.

Table 1. The age distribution of children with kerosene poisoning.

Age (year)	No. of cases	%
1-4	60 cases	83.3%
> 4-10	12 cases	16.6%
Total	72 cases	100%

Males were more frequently affected than females, with 54 cases (75%) compared to 18 cases (25%), resulting in a male-to-female ratio of 3:1. The majority of the patients—50 cases (69.4%)—were from urban areas, while 22 cases (30.6%) were from rural settings. Socioeconomic status appeared to be a contributing factor, as 55 patients (76.3%) came from low-income families, while only 17 cases (23.7%) belonged to families with a better socioeconomic status.

Family size also showed a notable trend, with 50 cases (69.4%) from large families (defined as more than six members), and 22 cases (30.5%) from smaller families (less than

six members). Regarding maternal occupation, the mothers of most affected children—56 cases (90.2%)—were housewives, while only 7 mothers (9.8%) were employed.

Improper storage of kerosene was a significant finding, with 53 families (73.6%) keeping kerosene in small, unsuitable containers, as detailed in Table 2.

Table 2. Demographic characteristics of the study group

Character of Patients	No	%
Sex: Male	54	75
Sex: Female	18	25
Residence: Urban	50	69.4
Residence: Rural	22	29.6
Family size < 6	22	30.5
Family size ≥ 6	50	69.4
Socioeconomic: Poor	55	76.3
Socioeconomic: Good	17	23.7
Mother Occupation: Housewife	65	90.2
Mother Occupation: Worker	7	9.8
Kerosene Storage: Small container	53	73.6
Kerosene Storage: Barrels	19	26.4

Within the first six hours of presentation, the most common clinical symptoms were cough, observed in 52 cases (72.2%), followed by tachypnea in 44 cases (61.1%) and vomiting in 43 cases (59.7%). Neurological symptoms such as drowsiness were reported in 14 cases (19.4%), while grunting was noted in 8 cases (11.1%), as detailed in Table 3.

Table 3. Signs and symptoms that appeared in the first 6 hours after ingestion.

Signs and symptoms	No. of patients	%
Cough	52	72.2
Tachypnea	44	61.1
Vomiting	43	59.7
Lung ronchi	24	33.3
Drowsiness	14	19.4
Intercostal retractions	13	18
Cyanosis	10	13.8
Decreased breath sounds	9	12.5
Grunting	8	11.1
Crepitations	6	8.3
Restlessness	4	5.5
Stupor	1	1.3
Convulsion	1	1.3

Beyond the initial six hours following kerosene ingestion, the most commonly reported symptom was fever, occurring in 35 cases (48.6%). Constipation was observed in 20 cases

(27.7%), followed by abdominal pain in 12 cases (16.6%). Chest pain was reported less frequently, noted in only 2 cases (2.7%), as presented in Table 4.

Table 4: Signs and symptoms that appeared after 6 hours

Signs and symptoms	No. of affected patients	%
Fever	35	48.6
Constipation	20	27.7
Abdominal pain	12	16.6
Chest pain	2	2.7

Among the patients who developed pneumonitis, 35 cases (81.3%) had a history of vomiting prior to the onset, while 16 cases developed pneumonitis without preceding vomiting, as presented in Table 5.

Table 5. Relation of vomiting to radiological pneumonitis

Case	Pneumonitis	No pneumonitis	Total
Vomiting	35 (81.3%)	8 (18.7%)	43 (100%)
No Vomiting	16 (55.1%)	13 (44.9%)	29 (100%)
Total	51 (70.8%)	21 (29.1%)	72 (100%)

Radiographic evaluations conducted six hours after ingestion revealed pulmonary infiltrates in various distributions. Right-sided infiltration was observed in 18 cases (25%), left-sided infiltration in 9 cases (12.5%), and bilateral infiltration in 24 cases (33.6%), as detailed in Table 6.

Table 6. Chest radiographic findings among the studied group

Diagnosis	No. of patients	%
Normal	18	25
Bilateral interstitial pneumonitis	24	33.6
Right lung interstitial pneumonitis	18	25
Left lung interstitial pneumonitis	9	12.5
Pleural effusion	1	1.3
Empyema	1	1.3
Atelectasis	1	1.3

White blood cell (WBC) counts were obtained for all patients after excluding other common causes of leukocytosis, such as otitis media. Among those diagnosed with pneumonitis, 51 cases (70.8%) showed elevated WBC counts. In comparison, leukocytosis

was also detected in 21 cases (29.2%) who did not develop pneumonitis. These findings are summarized in Table 7.

Table 7. Patients with leukocytosis after 6 hours of ingestion

(thousands of leukocytes per mm^3 of blood)

Patients	<15	>15	% from total pneumonitis	Total	% from total patients
With pneumonitis	17	34	66.6	51	70.8
Without pneumonitis	11	10	47.6	21	29.2

Analysis of seasonal presentation showed that the highest number of cases occurred during summer, with 37 patients (51.3%) presenting during this season. This was followed by 17 cases (23.6%) in autumn, 12 cases (16.6%) in spring, and only 6 cases (8.3%) during winter, as shown in Table 8.

Table 8. Distribution of patients according to the season

Season	No.	%
Summer	37	51.3

Autumn	17	23.6
Spring	12	16.6
Winter	6	8.3

All patients admitted to the emergency department were administered oxygen therapy. Additionally, 43 cases (59.7%) received intravenous fluids, and 51 cases (70.8%) were treated with antibiotics (ampiclox), as summarized in Table 9.

Table 9. Treatment of patients

O_2	**IV. Fluid**	**Antibiotics**
72 case	43 case	51 case
100%	59.7%	70.8%

DISCUSSION

Accidental kerosene ingestion remains a significant cause of childhood poisoning, particularly among families of low socioeconomic status, and is associated with high morbidity and occasional mortality.

In the current study, the majority of affected children were 3 years old (35 cases, 48.6%), with a male predominance (54 cases, 75%). These findings are consistent with previous reports by Arnold (12), Fagbule (11), Mchado B (13), and Dewet B (14). Most of the

cases (50 cases, 69.4%) were from urban areas and from economically disadvantaged families. This contrasts with findings reported by Abdul Aziz (15) and Hameed (16), possibly due to limited hospital access for rural families caused by transportation difficulties and security concerns.

Seasonal distribution revealed that most cases occurred during summer, followed by autumn. This may be attributed to children mistaking kerosene for water or a drink due to increased thirst in hot weather. Additionally, improper storage practices were commonly observed, with kerosene kept in small, unsuitable containers in 53 cases (73.6%). These findings align with the results of the South African study (17), as well as with those reported by Nouri (10), Fagbule (11), Abdul Aziz (15), and Hameed (16).

Kerosene poisoning primarily affected the respiratory and central nervous systems, in agreement with findings by Naji (9), Singh S (11), and Nouri (10). The most common presenting symptoms were cough (52 cases, 72.2%), tachypnea (44 cases, 61.1%), and vomiting (43 cases), similar to the reports of Arnold (12), Abdul Aziz (15), and Hameed (16). Respiratory symptoms were prominent, consistent with the studies by Naji (9), Abdul Aziz (15), and Hameed (16).

Radiological evaluation showed bilateral pneumonitis in 24 cases (33.6%), right interstitial involvement in 18 cases (25%), and left interstitial involvement in 9 cases

(12.5%). These findings may reflect anatomical differences between the lungs and are consistent with the observations of Naji (9) and Hameed (16).

Central nervous system manifestations were noted in 14 cases (19.4%). Hypoxia secondary to pneumonitis is the likely underlying cause, as supported by Majeed HA (18), who described a strong correlation between the severity of pulmonary involvement and the development of neurological complications. One child (1.3%) developed convulsions due to severe hypoxia following the ingestion of a large amount of kerosene, consistent with the findings of Naji (9).

Fever was observed in 35 cases (48.6%), and vomiting occurred in 52 cases (81.1%), mostly soon after ingestion and closely associated with the development of pneumonitis. These findings are supported by Naji (9) and Arnold (12). Constipation (20 cases, 27.7%) and abdominal pain (12 cases, 16.6%) were also reported later in the course, in agreement with Al-Naji (9). Leukocytosis, an indicator of pneumonitis, was frequently observed in affected cases, which aligns with Al-Naji's findings (9).

All hospitalized patients received oxygen therapy. In addition, intravenous fluids were administered in 43 cases (59.7%) to manage vomiting, and antibiotics were given in 51 cases (70.8%) to treat pneumonitis.

CONCLUSION

kerosene-induced pneumonia in Iraq typically presents with mild to moderate severity and, importantly, was not associated with any mortality in the observed cases. Clinical evaluation alone is insufficient to rule out pneumonitis; therefore, radiological imaging should be an essential part of the diagnostic process. Vomiting was identified as a significant risk factor for the development of pneumonitis, underscoring the need for health workers to educate caregivers about this risk following ingestion. The majority of affected children were boys, with the highest incidence occurring at three years of age. Kerosene poisoning was more prevalent during the summer months, likely due to environmental and behavioral factors. Among the clinical symptoms, cough emerged as the most common presenting feature, particularly within the first six hours post-ingestion.

RECOMMENDATIONS

To reduce the incidence and severity of kerosene poisoning, public health education campaigns should be widely implemented using television, radio, newspapers, and other media outlets. These campaigns must emphasize the dangers of storing kerosene in small, inappropriate containers, especially those that resemble bottles used for drinking water or soft drinks, which can easily be mistaken by children.

Families should also be advised not to induce vomiting in children following accidental ingestion of kerosene, as this significantly increases the risk of aspiration and subsequent pneumonitis.

The use of antibiotics should be limited to cases where there is clear clinical evidence of secondary bacterial infection, and unnecessary prescription should be avoided.

Finally, no patient should be discharged within the first six hours following kerosene ingestion, as pneumonitis can have a delayed onset. Observation during this critical period is essential to ensure timely detection and management of potential complications.

Ethical Clearance:

In accordance with the 2013 WMA Helsinki Declaration, all ethical aspects of this study were approved. Before enrolling the participants, an informed oral consent was obtained from their families as an ethical agreement. Additionally, approval from the hospital administrator was obtained.

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Conflicts of interest:

There are no conflicts of interest**.**

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