

Kerosene poisoning in childhood: A 6-year prospective study at the Princess Rahmat Teaching Hospital

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Abstract

PURPOSE: Poisoning due to drugs is influenced to a large extent by the population's socioeconomic and cultural status. The purpose of our study was to determine and present the pattern of poisoning with kerosene in Princess Rahmat Hospital, Irbid, Jordan, and to assess the effects of variables such as age, season, sex and agent on poisoning frequency in Princess Rahmat Hospital, northern Jordan.

METHODS: This retrospective cross-sectional study was performed on 122 cases of poisoning with kerosene who were hospitalized in Princess Rahmat Hospital, northern Jordan, during a six-year period from 1996 to 2001. The data collected include: age, sex, seasonal variation, material ingested, symptomatic or not on admission, time and place of ingestion, history of similar problem among the patient or his siblings, whether vomiting was induced by the parent before seeking medical help or not and the outcome regarding mortality and morbidity. Chi-square and values were considered for the statistical analysis.

RESULTS: In a 6-year prospective study of kerosene poisoning in children admitted to the rahmat Hospital, between January 1996 and December 2001, a total of 122 children (under 11 years of age). Among the children 48 (39.3%) were girls and 74 (60.6%) were boys. Majority (80.1%) were below 2 years. The largest group of patients was admitted during the summer months. The most commonly observed symptoms were cough (67.2%), tachypnea (56.5%), fever (54.1%), and vomiting (27.8%). About one third of the patients showed signs of central nervous system (CNS) impairment, including drowsiness, restlessness, stupor, and convulsions.

CONCLUSIONS: 1) There is a higher risk of kerosene poisoning during the hot months of the year; 2) the respiratory system is the main target organ affected; 3) pneumonia is in most cases interstitial and bilateral; 4) vomiting after hydrocarbon ingestion is related to the rate of development of pneumonia; 5) symptoms of CNS impairment were correlated with hypoxemia, pneumonia, and fever; and 6) CNS toxicity may occur without hypoxemia, concurrent pulmonary pathology, or other pathology.

Introduction

Poison is a substance capable of producing damage or dysfunction in the body by its chemical activity. It can enter the body in various ways to produce general or local effects (limited to the eyes, skin, lungs, etc.). All cases of poisoning that result from accidental use of drugs and chemical substances, or the use of drugs by children due to curiosity, are known as accidental or non-intentional poisoning. Poisoning is a qualitative term used to define the potential of a chemical substance in acting adversely or deleteriously on the body.¹⁻⁴

Kerosene is a petroleum distillate hydrocarbon that is a central nervous system depressant in high doses and a gastrointestinal and respiratory tract irritant [2-4]. In the present study, we summarize data on kerosene poisoning in our region between 1996 and 2001.

Materials and Methods

All cases of children diagnosed with hydrocarbon poisoning were taken from the computerized database of the Rahmat Hospital, Irbed, Jordan, from a six-year period between 1996 and 2001.

The medical records of these children were reviewed retrospectively. One researcher recorded the data from the medical files extracted from the database for each child using a standard form, which included an evaluation of clinical symptoms, a report of chest radiographic findings, a complete blood cell count, and a blood chemical analysis and included age, sex, seasonal variation, place of ingestion, the type of container in which the kerosene was kept, whether vomiting was induced or not by the parents before seeking medical help, and past history of ingestion by the patient or the siblings.

Results

In a 6-year prospective study of kerosene poisoning in children admitted to the rahmat Hospital, between January 1996 and December 2001, a total of 122 children (under 11 years of age). Among the children 48 (39.3%) were girls and 74 (60.6%) were boys. Majority (80.1%) were below 2 years.

The most common clinical presentation was coughing, tachypnoea and fever. Vomiting was induced by parents at home in 37 children.

Symptoms	No.(%)
Cough	82 (67.2)
Tachypnoea	69 (56.5)
Fever	66 (54.1)
Vomiting	34 (27.8)
Vomiting(induced)	37 (30.3)
Restlessness	43 (35.2)

Many households (52.3%) stored the agent in familiar beverage or household containers placed on kitchen

or bedroom floors, within easy reach of infants and toddlers. The most common sites of kerosene storage were:

Sites of kerosene storage	No. (%)
Under the stairs	49 (40.1)
In the kitchen	37 (30.3)
In the bathroom	21 (17.2)
In the living room	6 (4.9)
Elsewher	9 (7.4)

The most common containers in which kerosene kept:

Containers in which kerosene kept	No.(%)
Water jugs	20 (24.4)
Soft drink bottles	47 (39.3)
Water glasses	33 (27)

Seventy-six (69.7%) cases had home remedies. More than half of the cases (56.9%) presented within 12 hours of the accident due to persistent cough and dyspnoea. Respiratory complications viz pneumonia, pleural effusion and pulmonary oedema were the most common, evident in 67.3% of those who had chest radiographs. Approximately, three quarters (74.3%) of patients with radiological abnormalities. Severity of poisoning was influenced by the type of home remedy and the interval between accident. Presence of radiological or CNS abnormality or both, was associated with a higher morbidity. They were discharged from the hospital after an uneventful hospital stay of 48 hours.

Discussion

Accidental kerosene ingestion remains a serious contributor to childhood poisoning in low socioeconomic groups [2,3] with a high incidence of morbidity and occasional mortality [4,5]. Kerosene and other hydrocarbon toxicities affect mainly the respiratory system and the CNS. Respiratory symptoms (gasping, choking, grunting, coughing, and intercostal retractions) are the earliest signs of kerosene ingestion, and pulmonary pathology is the most serious complication.

Sufficient evidence has demonstrated the rapid onset of symptoms after hydrocarbon vapor inhalation or liquid aspiration [6,7]. Because of their high volatility, low viscosity, and low surface tension, hydrocarbons penetrate into distal airways and spread over a large area of lung tissue [8]. Pulmonary lesions produced by these substances present a combination of lung irritation with loss of surfactant and features of lipid pneumonia [9,10]. The etiology of CNS symptoms (headache, dizziness, drowsiness, restlessness, seizures, and coma) is not clear, but hypoxia has been suggested as the main cause [11]. Gastrointestinal involvement (nausea, vomiting, abdominal pain, and diarrhea) has been attributed to mucosal irritation [12].

Our data show that, in our area, 94% of the hydrocarbon-poisoned patients are villager's children. The economic level of most of these families is low, and they tend to live in rural regions. Kerosene is a common household commodity. Parental supervision is often lacking; therefore, these children are at high risk for kerosene poisoning. Similar to a South African study [12] our investigation indicates that a statistically significant larger number of cases of hydrocarbon poisoning occurred in summer than in winter, spring, or autumn and a higher incidence in spring and autumn than in winter. During hot seasons, the child is likely to be thirsty and may mistake kerosene (or another hydrocarbon) for water or another cold drink. Patients were predominantly boys, and 92% were 3 years and younger. These data are similar to those found in other studies, which reported a high incidence of kerosene poisoning in boys 3 years and under [13]. Also, similar to other investigators [3, 6,7] we found a high prevalence of symptoms relating to the respiratory system, and about 60% of the patients had a fever (38°C or greater) [3,14]. Vomiting after ingestion occurred in half of our patients and was significantly correlated with pneumonitis. This result is in agreement with experimental data showing that kerosene aspiration causes the development of pulmonary pathologies [8,9]. It also agrees with the findings of another study [9] in which it was suggested that vomiting after kerosene ingestion may cause aspiration. In contrast to our findings, Dudin et al [15] did not find an increased risk of respiratory complications related to vomiting after kerosene ingestion. This might be because of the relatively small number of patients in their study. Pulmonary abnormalities were manifested predominantly in interstitial pneumonitis that was mostly bilateral.

Fever, symptoms of CNS impairment, and hypoxemia were frequent findings. Hypoxemia and fever as well as pneumonia were significantly correlated with symptoms of CNS involvement ($P < .001$). It is widely accepted that hypoxia is the cause of CNS symptoms in cases of kerosene poisoning. Majeed et al [16] reported a close relationship between the severity of pulmonary involvement and the development of neurological complications. It can be speculated that fever exacerbates CNS impairment. However, 9% of our patients with CNS symptoms had no hypoxemia, pneumonia, or fever. Thus, according to our results, other factors (eg, a direct CNS hydrocarbon toxic effect) may also play a role in the pathogenesis of CNS involvement.

Leukocytosis is an indication of pneumonitis, and our study showed a 2.3 times higher incidence of leukocytosis in children with radiologically documented pneumonitis than in children without.

Medical care was mainly supportive. Patients received antipyretics, intravenous fluids and electrolytes, and humidified oxygen when necessary. Antibiotics were prescribed when supportive treatment proved insufficient and secondary bacterial infection was suspected. Patients whose condition was severe (6.5% of the in-patients) were transferred to the ICU. There were no deaths. Two other studies of children hospital-

ized for kerosene poisoning, one with 205 patients [16] and the other with 140 patients [17] also reported no fatalities. However, investigations in India and South Africa have reported incidents of death, though usually at a low rate. Gupta et al [7] reported a 4.3% mortality rate. Lucas [18] recorded 3 deaths in his study of 526 patients, and Ellis et al [12] also reported a low fatality rate (0.74%).

According to our study, there is a higher risk of hydrocarbon poisoning during the hot months of the year. The respiratory system was the main target organ in hydrocarbon poisoning. Pneumonia was mostly interstitial and bilateral. Vomiting after hydrocarbon ingestion affected the rate of pneumonia development. Symptoms of CNS impairment correlated with hypoxia, pneumonia, and fever; however, CNS toxicity can occur without concurrent pulmonary or other pathology. In this study, the data were collected retrospectively and are therefore subject to errors of omission or incomplete documentation.

In conclusion, projects for the prevention of such poisoning incidents within the general population, especially within the Bedouin community, are definitely needed and should be implemented as soon as possible.

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