

# KEROSENE OIL POISONING — A CHILDHOOD MENACE

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## ABSTRACT

*This study documents 3-year retrospective analysis of accidental kerosene oil poisoning in 70 children with regard to clinical profile, radiological changes and outcome. About 77% of cases were between 1 and 3 years old. Fifty children (71.4%) developed significant symptoms, with onset soon after to within 10 hours of ingestion. These included breathlessness (55.7%), fever (47.1%), cough (31.4%), restlessness (25.7%) and abdominal distension (15.7%). Chest X-rays were obtained in 65 children. Abnormal radiographs were seen in 45 (69.2%) children with right basal infiltrates being the commonest picture (21.4%). Ingestion of more than one ounce of kerosene oil adversely affected the clinical and radiological profile. Severely malnourished children had extensive radiological changes and poorer clinical outcome. One case developed myocarditis, a complication which has not been reported to the best of our knowledge. Mortality rate was 4.3%. All deaths occurred within 48 hours of admission.*

**Key words:** Kerosene oil, Poisoning.

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*Received for publication: November 1, 1991;*

*Accepted: February 6, 1992*

Accidental kerosene oil poisoning continues to remain a serious pediatric problem in India and other developing countries(1-4). The reasons are essentially two fold. Kerosene oil is extensively used as fuel for cooking and lighting purposes due to shortage of cooking gas and electricity. Moreover, kerosene oil is stored in soft drink and beer bottles which remain within easy reach of curious and prancing children. The present retrospective study highlights clinico-radiological profile of 70 children with kerosene oil poisoning.

## Material and Methods

Case records and chest radiographs of 70 children with kerosene oil poisoning who were admitted to the pediatric emergency between January 1988 to December 1990 constituted the material for this study. Chest radiographs were obtained in 65 children within six hours of admission. The clinical findings related to age, sex, nutritional status, amount of kerosene ingested, symptoms at the time of admission, hospital course and outcome were analysed. Chest radiographs were reported by a single person to minimize inter-observer bias. The extent of lung involvement was classified as per Foley's criteria, i.e., Group-I—normal radiograph, Group-II—less than 10% lungs involved, Group-III—10-30% involvement, and Group-IV—more than 30% lungs involved(5).

All patients were hospitalized and observed for a minimum of 24 hours. Gastric lavage was not done in any child. Parenteral antibiotics (Penicillin + Chloramphenicol), humidified oxygen and supportive management with intravenous fluids were provided to symptomatic children. Two children who developed respiratory failure were treated with assisted ventilation. Presence or absence of symptoms and

abnormal radiographs were correlated with each other and with other clinical parameters. The results were analysed using Chi square test.

## Results

Kerosene oil ingestion constituted 46.4% of admissions due to accidental poisonings in childhood. Most of the children consumed kerosene oil from soft drink bottles or plastic jars. Affected children were between the ages of 3 months and 8 years (mean age 2 years) with maximum number of cases (77.1%) presenting between the age of 1-3 years. Forty five children were boys and 25 were girls; 68.6% were malnourished (weight less than 80% of 50th centile of Harvard standards). Nineteen cases (27.2%) were severely malnourished and weighed less than 60% of their expected weight.

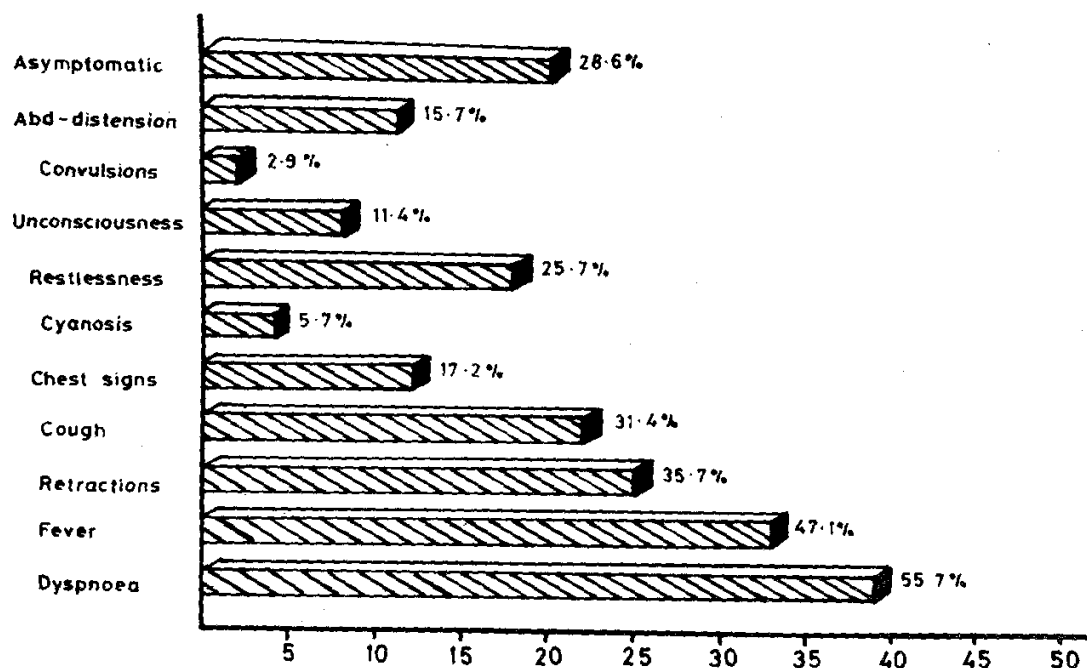
Children were brought to the hospital between 10 minutes and 24 hours after an episode of kerosene oil ingestion. The amount ingested varied between a mouth-

ful to approximately 5 ml. In 5 cases, history regarding amount ingested was not available.

Of 70 cases, 20 (28.6%) remained asymptomatic. In the rest, mean interval between ingestion of kerosene and appearance of symptoms varied from immediate to 10 hours with a mean of one hour.

Fever and breathlessness were the commonest manifestations. Signs and symptoms related to the respiratory tract dominated the clinical presentation (*Fig.*). The duration of hospital stay varied from 24 hours to 192 hours with a mean of 48 hours. Age, sex and nutritional status were not significantly different in symptomatic vs asymptomatic children, but a positive correlation existed between presence of symptoms and intake of more than 1 ml of kerosene (*Table I*).

Radiological changes were observed as early as 45 minutes after ingestion. The commonest radiological finding was right basal infiltration. Obstructive emphysema, pleural effusion and pneumatoceles were also observed (*Table II*). Radiological



*Fig. Clinical Presentation of Kerosene Oil Poisoning.*

**TABLE I** —*Clinico-Roentgenic Findings in Relation to Ingested Kerosene Oil*

	Amount ingested	
	<1 ml	>1 ml
Presence of symptoms	55.3% (21/38)	92.6%* (25/27)
Presence of abnormal X-ray	48.5% (16/33)	88.9%* (24/27)

Figures in parentheses indicate numbers.

\* ( $p < 0.005$ ).

changes were seen significantly more often in children who consumed more than 1 ml of kerosene oil (*Table I*). The extent of lung involvement as assessed by Foley's classification had statistically positive correlation with (i) severity of malnutrition (weight less than 60% of expected), (ii) amount of kerosene oil ingested (>1 ml), and (iii) clinical symptomatology (*Table III*). It was interesting to note that children who had vomited prior to hospitalization did not differ from those who had no vomiting after kerosene oil ingestion regard-

**TABLE II**—*Radiological Findings in Kerosene Oil Poisoning (n = 65)*

Finding	Right	Left	Bilateral	Total	%
Normal	—	—	—	20	30.8
Extensive bronchopneumonia	—	—	7	7	10.8
Basal infiltration	15	1	4	20	30.8
Perihilar infiltrates	8	—	9	17	26.2
Lobar pneumonia	5	1	2	8	12.3
Obstructive emphysema	—	2	6	8	7.2
Pleural effusion	3	—	—	3	4.6
Pneumatocele	—	—	1	1	1.5

**TABLE III**—*Correlation of Extent of Radiological Lung Involvement with Amount Ingested, Malnutrition and Clinical Symptomatology*

	Extent of radiological lung involvement			
	Normal X-ray	Gr-I (<10%)	Gr-II (10-30%)	Gr-III (>30%)
A. Amount ingested				
>1 ml (n = 27)	3	10	7	7 *
<1 ml (n = 33)	17	11	2	3
B. Percentage weight				
< 60% of expected (n = 17)	2	2	5	8 **
> 60% of expected (n = 48)	18	22	6	2
C. Presence of clinical symptoms				
Yes (n = 49)	10	19	10	10 ***
No (n = 16)	10	5	1	—

\*  $p < 0.005$ ; \*\*  $p < 0.001$ ; \*\*\*  $p < 0.01$ .

ing symptoms and radiological extent of lung involvement.

Complications were seen in the five children which included myocarditis ( $n=1$ ), respiratory failure ( $n=2$ ) and convulsions ( $n=2$ ). Both patients with respiratory failure and one with myocarditis expired. All complications and deaths occurred within 48 hours of admissions. The three children who died were severely malnourished and their chest radiographs revealed extensive bronchopneumonia.

## Discussion

Accidental kerosene oil poisoning continues to be a childhood menace in the developing world. It constituted 0.1% of total pediatric emergencies and 46.4% of all accidental childhood poisoning during the study period. The reported incidence of kerosene oil ingestion varies from 33 to 60% amongst poisonings in childhood(1,2,5). Low socio-economic status of the population catered to by the hospital and shortage of cooking gas and electricity contributed to ready availability of kerosene, a cheaper fuel, in majority of households. More often, kerosene was peculiarly stored in containers meant for drinking water and left carelessly. Easy accessibility of kerosene oil compounded by negligence and lack of supervision on part of parents, added to give rise to such a staggering incidence of kerosene oil poisoning.

Toddlers become an easy target due to their natural curiosity. In the present study 77% cases occurred between the ages of 1-3 yrs. Similar findings have been reported earlier(1,6). Surprisingly, the youngest affected in our study was a 3-month-old boy who was fed kerosene oil by his overenthusiastic 3-year-old sister who could not resist the temptation of consuming the substance herself and subsequently

both were admitted to the hospital.

In present study, 71.4% of cases were symptomatic. Santhanakrishnan *et al.* reported that 44% of children in their study developed symptoms after ingesting kerosene oil as against 71.4% reported by Brunner *et al.*(2,7). Since kerosene oil consists of straight chain hydrocarbon of methane series having variable carbon atoms, it is possible that differences in kerosene oil composition affected the clinical presentation. This may be further compounded by the impurities found in kerosene oil from place to place. Respiratory symptoms were present in 71.4% (*i.e.*, in all symptomatic children) as against the reported incidence of pulmonary involvement varying from 41.9 to 80% in other studies(1,4,6,8). Neurological changes in form of restlessness, coma and convulsions occur due to depressant effect of hydrocarbon on brain, after absorption of kerosene oil from GIT and respiratory tract(5).

It is doubtful whether vomiting increases the risk of pulmonary involvement by predisposing to aspiration. Foley and American subcommittee have observed an increased incidence of pulmonary complications and pneumonia in patients who had vomiting(5,6). In contrast, in the present and earlier(8) series, no relationship was observed between vomiting and clinico-radiological manifestations.

The American Sub-committee report observed that ingestion of more than 1 ml of kerosene oil was significantly related to pulmonary complications(6). The present study reaffirms the above view. Children who consumed more than 1 ml of kerosene oil were significantly at higher risk for developing symptoms and having an abnormal radiograph.

The commonest radiological abnormality observed was basal infiltration (30.8%)

followed by perihilar infiltration (26.2%). Other studies have also documented that basal infiltrates were the commonest radiological change(4,5,7,8). The predilection for basal segments is consistent with aspiration of any foreign agent. Pleural effusion, pneumothorax, pneumatoceles, pneumopericardium have also been described(4,7,9,10).

Interestingly, presence of malnutrition significantly increased the extent of lung involvement and adversely affected the clinical outcome. Extensive radiological involvement (Foley's Group III) was seen in 47% of severely malnourished children. Compared to this, only 4.2% of the remaining children (wt > 60% of expected) developed Group III changes. Similarly, mortality was seen exclusively in severely malnourished children. Unfavorable outcome of kerosene oil poisoning in malnourished children has not been reported earlier. As yet we do not have any satisfactory explanation for this phenomenon.

Encephalopathy, a known complication of kerosene oil poisoning is either due to hypoxia or depressant effect of kerosene oil on the brain. Myocarditis has not been reported earlier although radiologically cardiomegaly has been observed(4). Aliphatic hydrocarbons have been known to cause cardiac enlargement by their direct toxic effect(11). Kerosene oil probably causes myocarditis by a similar mechanism.

Mortality due to kerosene oil poisoning has remained unchanged over the last quarter of century. The observed mortality in the present study of 4.3% falls well within the range of 2-10% noted by various authors(7). The complication and deaths occurred within 48 hours of admission which is the crucial period for these children.

To conclude, the dangers of kerosene

oil and measures necessary to prevent its accidental ingestion by children should be actively and repeatedly stressed. Parents and older children should be warned about proper storage and usage of this necessary evil.

### Acknowledgements

The authors acknowledge the Pool-Scheme of CSIR, Government of India, for assistance.

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## NOTES AND NEWS

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