

Original Article

Soiling as a Deterrent Against Accidental Kerosene Ingestion

Swar M O,¹ Sharfi Z H,² Khawaga M A³ and Elfakey W E M⁴

(1) Swar M.O. Associate Professor of Paediatrics, Ahfad University for Women.

(2) Sharfi Z. H. Professor of Community Medicine, AUW.

(3) Khawaga M.A. Professor of Radiology, AUW.

(4) Elfakey W E M, Assistant Professor of Paediatrics, University of Juba

Correspondence: Dr. M O Swar, Mobile 0915127922, E-mail: moswar @ hotmail.com- P.O. Box 167, Omdurman, Sudan

ABSTRACT

Introduction:

Kerosene accidental poisoning is increasingly seen in children coming from areas where it is used for cooking, heating, lighting and as paint thinner.

Objectives:

The aim of this study is to determine the source, presenting symptoms, complications and radiological changes in children presenting with kerosene poisoning and to test «Soiling» as a deterrent against accidental kerosene ingestion.

Patients and methods:

This is a hospital based prospective study that included all patients who were admitted to Ombada Teaching Hospital having ingested kerosene during the period September 2005 to September 2007. Soiling kerosene containers from outside is used as a deterrent against kerosene ingestion.

Results:

A total of 115 patients with accidental kerosene poisoning were seen. Sixty were females (52.2%) and 55 males (47.8%). Mean age was 31.8 months (S D± 23.7) with Confidence Interval of the Mean almost (2830-). The commonest presenting symptom was cough seen in 99 patients (86.1%) and difficulty

breathing in 62 (53.9%). Spontaneous vomiting was seen in 41 patients (35.7%) and induced vomiting in 27 patients (23.5%). Thirty patients (26.1%) developed fever and 5 presented with diarrhea (4.3%). Central Nervous System involvement included agitation in 17 patients (14.8%), stupor in 11 (9.6%), coma in 4 (3.5%), and convulsions in one patient (0.9%). Bilateral radiological features of pneumonia were seen in 41 patients (35.7%), right side involvement in 27 (23.5%), left side involvement in 6 (5.2%) and 41 patients showed normal chest x-ray (35.7%). A strong correlation between lapse of time and radiological changes is documented using Chi square test (P = .002). In 89 patients (77.4%) the source of kerosene was plastic disposable soft drink bottles. The amount taken was estimated by report as a sip in 38 patients (33%), less than one cup in 41 (35.6%) and was unknown in 36 (31.4%). Soiling Test was positive in the 17 patients tested (100%). Three patients died of circulatory collapse, respiratory failure and air block respectively. Case fatality rate was 2.6%.

Conclusion:

Kerosene poisoning remains to be an important cause of morbidity and potential fatality. Soiling, a simple and effective method of prevention is

advocated.

Key words: Kerosene, poisoning, source, radiological changes, soiling, prevention

Introduction:

Kerosene is a flammable petroleum distillate, insoluble in water and has a characteristic odour. It is commonly used for heating, cooking and lighting in areas where there is no electricity supply. Low viscosity and surface tension accounts for its spreading tendency and potentiate for aspiration. Inhalation of kerosene leads to headache, dizziness, in-coordination and euphoria. Ingestion causes nausea, vomiting, diarrhoea and abdominal distension while aspiration leads to choking, coughing and lipid pneumonia. Central Nervous System involvement results from hypoxia of the brain and presents with irritability, stupor, ataxia, convulsions and coma. Kerosene, though it is a pH neutral solution, when spilled over the eyes, can lead to irritation and excessive lacrimation. Dermal complications include defatting, cracking and blistering of the skin. Toxicity may also affect the kidneys, cardiovascular system and liver (1).

Kerosene accidental poisoning is increasingly seen in children coming from suburban and peripheral areas of towns. The problem is more manifest in temporary camps set for immigrants and war displaced people in Ombada area, North West of Khartoum-Sudan, where lack of electricity and water supply, poverty, poor housing, overcrowding and illiteracy prevail.

Objectives:

The aim of this study is to determine the source, presenting symptoms, and complications of kerosene poisoning in children admitted to Ombada Teaching Hospital and to test the «Soiling method» as a deterrent against accidental kerosene ingestion.

Patients and methods:

This is a hospital based prospective study that included all children admitted to our unit in Ombada

Teaching Hospital having ingested kerosene during the period September 2005- September 2007. A standard questionnaire form –compatible with SPSS data entry style- was used by all physicians as a guideline of management. All patients were kept in hospital under observation for 24 hours. Longer stay, investigations and treatment modalities were dictated by each patient's condition. «Soiling Test» was applied on patients who were >3years of age (17 patients). The test is carried out by using two of the commonly used plastic bottles containing kerosene. One is kept clean and the other was soiled with kerosene and dust from outside. The child is then asked by his/her mother to bring to her the water bottle out of those two bottles. The test is repeated for the same child by reversing the position of the bottles on the table. Positive test is indicated by selecting the clean bottle.

Results:

A total of 115 patients were seen, 60 females (52.2%) and 55 males (47.8%) with no statistically significant sex difference. Mean age was 31.8 months (SD \pm 23.7) with Confidence Interval of the Mean almost 28 – 30. Weight ranged from 4 Kg to 31 kg. Seven patients were under weight according to Wellcom Classification of protein energy malnutrition.

The commonest presenting symptoms were cough (86.1%), difficulty breathing (53.9%), spontaneous vomiting (35.7%), induced vomiting (23.5%), and fever (26.1%). Central Nervous System involvement included agitation (14.8%), stupor (9.6%), convulsions (0.9%) and coma (3.5%) (Table 1).

Bilateral radiological features of pneumonia were seen in 41 patients (35.7%), (Fig 1, 2), right side involvement in 27 patients (23.5%), left side involvement in 6 patients (5.2%), (Fig 3) and 41 patients showed normal chest X-ray (35.7%),

(Table 2).Pneumomediastinum with subcutaneous emphysema (Fig 4), pericardial and pleural effusions (Fig 5) were seen in association with other parenchymal lesions in 3 different patients. A strong correlation between lapse of time of ingestion and the appearance of radiological features is documented using the Chi Square Test ($P=.002$).

In 98 patients (77.4%), the source of kerosene was plastic disposable soft drink bottles and in 13 patients (11.3%), the source was glass cups (Table 3). Plastic cans, metallic cups and bowls were reported by other patients. The amount taken was estimated by report as a sip in 38 patients (33%), less than one tea cup in 41 patients (35.6%) and was unknown in 36 patients (31.4%), (Table 4).Soiling Test was positive in the 17 patients tested, age >3 years (100%) (Fig 6 a and b). One patient needed readmission for cardiomegaly and congestive heart failure, treated and discharged in a good condition. Transient oliguria without gross renal function impairment was seen in two patients. Three patients died of circulatory collapse, respiratory failure and air block respectively. Case Fatality Rate was 2.6%.

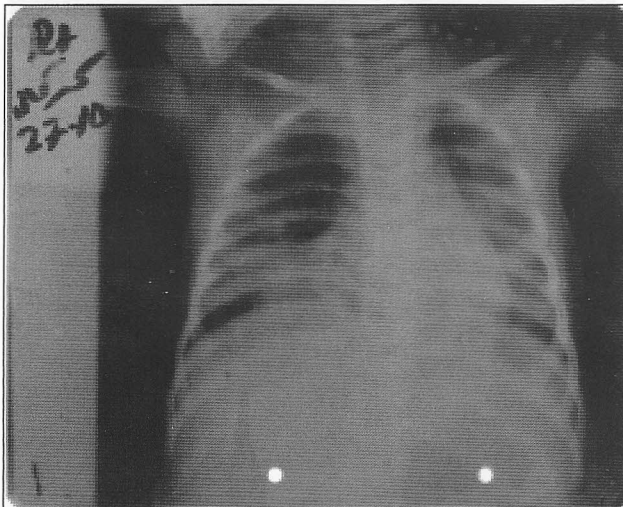


Fig (1) Bilateral pneumonic consolidations

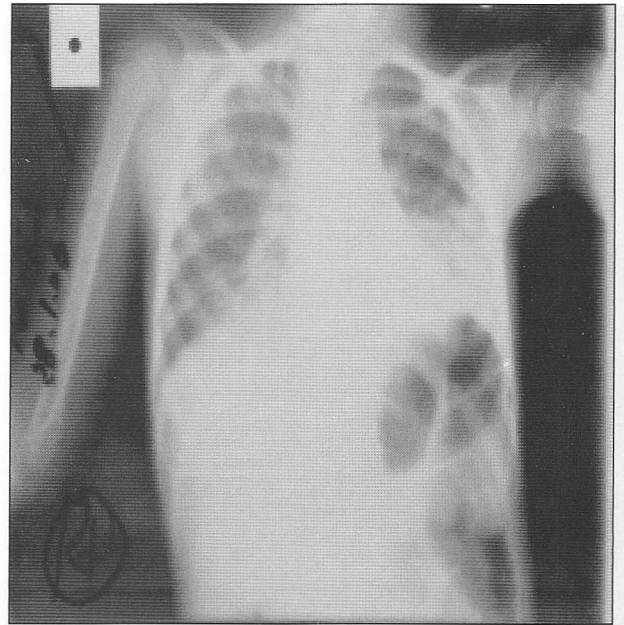
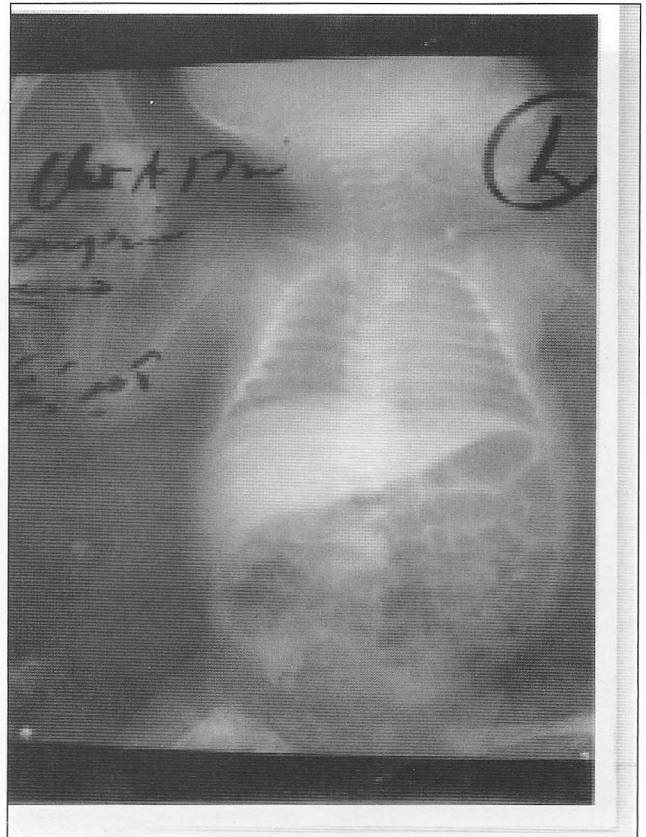


Fig (2) Bilateral basal consolidations and a cervical rib (Rt.)





(3) Left lung collapse and right lung emphysema



Fig (4)Pneumomediastinum and subcutaneous emphysema

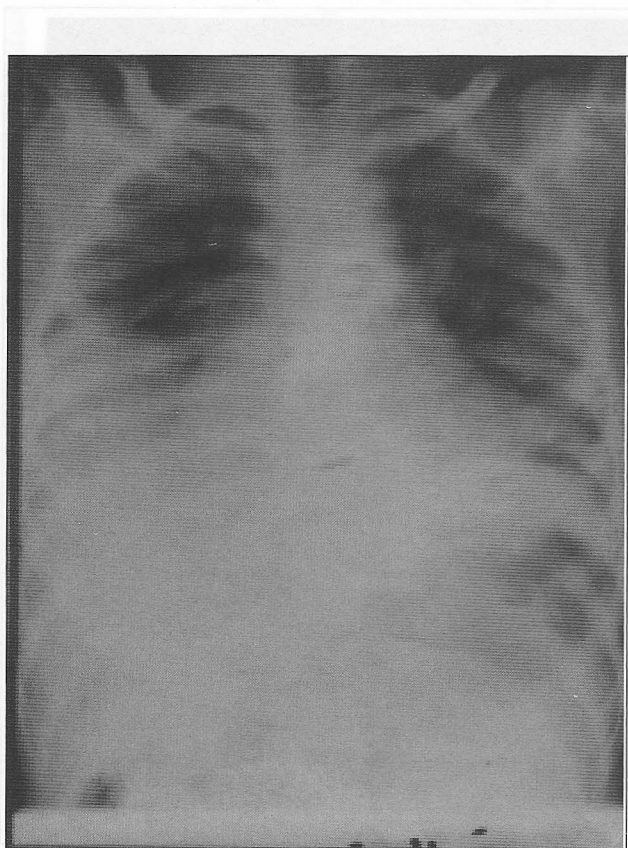


Fig. (5) Pleural effusion

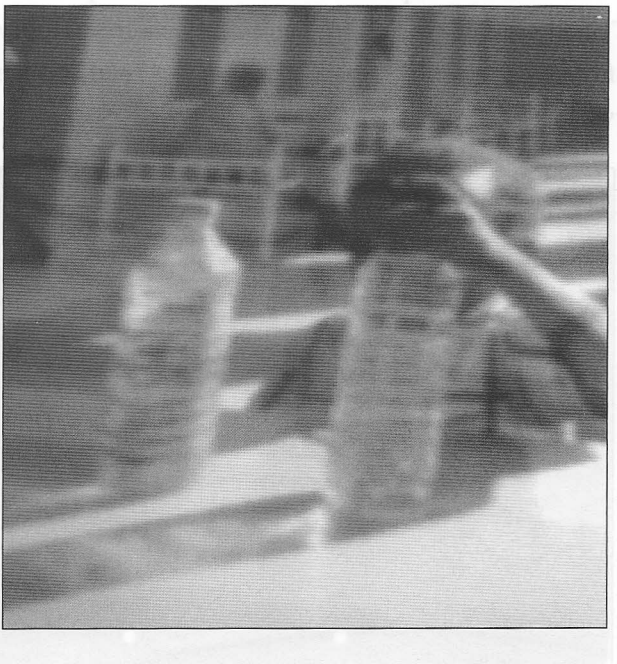


Fig. 6a: Mother is asking for water (soiled bottle on the left hand side)

Table (1) Presenting symptoms

Symptom	Number	Percentage
Cough	99	86.1%
Difficulty breathing	62	53.9%
Spontaneous vomiting	41	35.7%
Fever	30	26.1%
Induced vomiting	27	23.5%
Agitation	17	14.8%
Stupor	11	9.6%
Diarrhoea	5	4.3%
Coma	4	3.5%
Convulsions	1	0.9%

Table (2) Duration between ingestion and appearance of radiological changes

Lapse	Rt. side	Lt. side	Bilateral	Normal	Total
< One hour	17(23.9%)	2(2.8%)	23(32.4%)	29(40.8%)	71
1 – 4 hours	7(23.9%)	0	15(46.9%)	10(31.3%)	32
4 – 12 hours	1(16.7%)	2(33.3%)	1(16.7%)	2(33.3%)	6
12 – 24 hours	1(100%)	0	0	0	1
> 24 hours	2(20%)	2(40%)	2(40%)	0	5
Total	27(23.4%)	6(5.2%)	41(35.7%)	41(35.7%)	115

*(P.002)

Table (3) Source of kerosene

Container	Number	Percentage
Soft drink bottle	89	77.4%
Cup	13	11.3%
Others	13	11.3%
Total	115	100%

Table (4) Amount of kerosene ingested

Container	Number	Percentage
A sip	38	33%
≥ 1/3 tea cup	32	27.8%
≥ 2/3 tea cup	9	7.8%
Not known	36	31.4%
Total	115	100%

Discussion:

Although kerosene poisoning is an increasingly seen problem in the peripheries of towns and suburban areas in Sudan, there is still a paucity of published studies pertaining to it. In consistence with studies done in comparable areas (1, 2, 3), kerosene poisoning is the most commonly seen poisoning in the paediatric age group in Sudan.

A striking seasonal variation of incidence was reported by different authors (4, 5), however, in our series the occurrence of the problem was regular through out the year except for the days before Eid holidays when it rose because of the increased use of kerosene as paint thinner. The commonest source of kerosene as seen in other reports (6) was plastic soft drink bottles that are available at no cost. In over crowded houses with no electricity or water supply and when cooking, bathing, eating and sleeping are in one and the same room, all smell the same and for a child in the dark, it is all fluids!(7). Mean age group is higher than previous reports (8), indicating that toddlers were mostly affected as kerosene was mistakenly taken for water and no suicidal attempts were reported. In agreement with other reports (9), involvement of the respiratory system was the commonest presentation. Similarly, were the serious complications that included subcutaneous emphysema, pleural effusion, congestive heart failure and lung collapse (10, 11).

The chain of distribution of kerosene from whole sale and retailers to the consumer in these residential areas is very far from being sterile (Fig 5, 6). Considering this fact coupled with the severe and rapid inflammatory process in the lungs that leads to radiological changes within one hour of ingestion, we treated our patients with antibiotics (Benzyl Penicillin: 50000 U/Kg/day iv + Gentamycin: 5 mg/Kg/day iv), Hydrocortisone (5mg/Kg/6hr iv) and Oxygen (4L/min) during the first 24 hours of hospital stay and thence as their conditions dictate (12, 13).

Though 97.4% of our patients recovered completely; kerosene poisoning remains to be an important cause of morbidity and potential fatality in children. Long term residual effect is yet to be determined and further studies are needed to establish that.

It is beyond our capabilities to fight against poverty, poor housing, overcrowding, illiteracy, ignorance and negligence. However, setting laws that prohibit reuse of plastic soft drink bottles is mandatory. Colouring kerosene and flavouring it to taste bad, as practiced in Jamaica (14), might help reducing the incidence of ingestion during day light but not in the dark. We believe that Soiling of kerosene containers from outside is a simple, cost-effective and reproducible measure that can be applied by mothers at home if properly advised. Dirty appearance during the day and the greasy and harsh sensation of the outer surface of the container in the dark are strong deterrents against accidental ingestion of kerosene by children. Water and electricity supply to these areas is probably the magic stick!

Acknowledgment:

We would like to thank all paediatric physicians in Ombada Teaching Hospital who cared for the study patients and helped in collecting data. We also thank Ustaz Eissa for his great help in statistical analysis.

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