

# PROGNOSTIC SCORE FOR KEROSENE OIL POISONING

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## ABSTRACT

*Ninety five consecutive children with kerosene oil poisoning were studied, the first 70 retrospectively (internal group) and the rest 25, prospectively (external group) over a period of 3 years and 8 months.*

*Based on clinical features and severity of illness in initial 70 cases, a weighted scoring system to determine the outcome was evolved. This included: (i) fever—absent 0, present 1; (ii) severe malnutrition—absent 0, present 1; (iii) respiratory distress—absent 0, present 2, with cyanosis 4; and (iv) neurological symptoms—absent 0, present 2, with convulsions 4. The scores ranged from 0 to 10 in the internal group. Using discriminate function analysis, a score of 4 or more was found to be associated with prolonged hospital stay and complications. The risk of dying increased if the score was equal to or more than 8. The predictive value of the score was 85.7%. For validation, this scoring was applied to the external group as well and 84% of cases could be correctly predicted.*

**Key word:** Kerosene oil poisoning.

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*Received for publication: November 26, 1991;*

*Accepted: April 25, 1992*

Accidental ingestion of kerosene oil is one of the most common poisonings in childhood(1-3). The problem is not limited to India and can lead to serious illness(4-6). Kerosene oil is used extensively in areas where alternative energy sources like electricity and cooking gas are not readily available. Such areas are usually remote and away from tertiary hospitals. It is essential to have a clinical predictive score to judge the severity of illness and serve as a referral criteria. The present study was undertaken with the objective of evolving a prognostic score and evaluate its role in predicting the severity of kerosene oil poisoning in children.

## Material and Methods

Ninety five consecutive children with kerosene oil poisoning were studied, the first 70 retrospectively (internal group) and the next 25 prospectively (external group). These children were admitted to the pediatric emergency services between January 1988 to August 1991. The clinico-radiological profile of the cases belonging to the internal group has been previously reported(7).

For the purpose of this study, children in the internal group were divided into two groups based on the severity of illness.

Group A—Cases who were asymptomatic at 24 hours after admission.

Group B—Cases who had either of following:

- (i) Respiratory distress, coma or fever persisting for more than 24 hours.
- (ii) Complications including encephalopathy, myocarditis or respiratory failure at any time after admission.
- (iii) Died.

These groups were compared with each

other with respect to age, sex, nutritional status, amount of kerosene oil ingested, clinical features and chest radiograph findings. The results were analysed using chi-square test. A weighted scoring system was evolved based on the levels of significance of differences obtained. For each patient, the total score was calculated. A discriminate function analysis was carried out using the scores on each subject and the probabilities of belonging to Group A or B. The discriminate function analysis was carried out using SPSS software on compatible IBM PC/AT 386 computer. The criteria for maximization was taken as sum of squares between groups divided by sum of squares within groups. After obtaining the score at which best discrimination was obtained, a predictive value for such discrimination was calculated. In order to evaluate validation of such discrimination, we applied this score on 25 new cases of kerosene oil poisoning (external group). The predictive value for this group was also obtained and compared with that of the internal group.

## Results

On the basis of severity, children in the internal group were divided. There were 41 cases in Group A and 29 in Group B. The clinical features and radiological findings in these groups is shown in *Table I*. A scoring system was constructed based on the levels of significance of differences between the two groups.

Severe malnutrition and fever, where the 'p' value between the groups was  $<0.05$  and  $>0.001$ , were given a score of 1 each. Factors including respiratory distress and coma where p value was  $<0.001$ , were given a score of 2 each. Presence of cyanosis with respiratory distress and convulsions with coma were given an additional

score of 2 each. The amount of kerosene oil ingested, though significantly different in the two groups was not used in evolving the score because information on amount ingested may not be always available or be unreliable. Similarly, the results of the chest radiographs were also not included as facilities for X-rays may not exist at remote centres where the scoring system is needed most to severe as a referral criteria. Thus, a scoring system with a maximum score of 10 was created. The total score was calculated on each patient in the internal group and ranged from 0 to 10.

By using discriminate function analysis, prior probabilities of 70 cases in internal group of belonging to either severity Group A or B were 0.586 and 0.414, respectively. The best discrimination as obtained when score less than or equal to 3 was assigned to Group A and higher score to Group B. Such discrimination was correctly able to predict 37 of 41 cases belonging to Group A (90.2%) and 23 out of 29 cases (79.3%) belonging to Group B. Thus, 85.7% cases were correctly classified. When the same scoring and discrimination was applied to the external group of 25 cases (*Table I*), correct classification could be obtained in 84% cases (*Table II*).

Of the total 95 cases, 3 died; 2 of these had a score of 8 or more. The positive and negative predictive value of this score, in predicting cases of death, was 50 and 98.8%, respectively.

## Discussion

This scoring system, is based on actual level of significant differences between the two severity groups. On the basis a weighted score is justified. Presence of convulsions and cyanosis were given additional scores because: (i) children in whom these symptoms were present belonged to

TABLE I—Clinical Features in Kerosene Oil Poisoning

Feature	Internal group		External group	
	Group A (n = 41)	Group B (n = 29)	Group A (n = 15)	Group B (n = 10)
Age (yrs)				
<2	29	20	10	6
>2	12	9	5	4
Male : Female	26:15	19:10	11:4	6:4
Weight (< 60% expected)	6	13**	1	7**
Amount of kerosene ingested				
≤30 ml	30	8**	13	2**
>30 ml	10	17	2	8
Symptoms				
Vomiting	13	11	4	3
Fever	13	20**	6	4
Resp distress	5	20***	9	10*
Resp distress + cyanosis	0	4	0	2
Coma	6	20***	4	8*
Coma with seizures	0	2	0	1
Abnormal chest X-ray	17	28***	4	10

\*p<0.05, \*\* p<0.005, \*\*\*p<0.001

TABLE II—Predictive Value of Prognostic Score in External Group

Actual group	Predicted group	
	A	B
A (n = 15)	12 (80%)	3 (20%)
B (n = 10)	1 (10%)	9 (90%)

Predictive accuracy = 84%.

the more sick children (Group B) and, (ii) 3 of the 6 children with cyanosis or convulsions or both, died; thus justifying the extra weightage given to these two parameters. The amount of kerosene oil ingested and the radiological features were not included in the scoring system. Their

inclusion would have not only made the scoring scale more complicated; but in case information on any one of these was not available, also defeated the very purpose of evolving this score.

Our scoring system, when categorised into less than or greater than 3 could actually predict nearly 85% cases, which could be considered satisfactory.

The scoring system theoretically has its limitations. An over-optimistic picture might emerge if a patient scores 1 for malnutrition and 2 for coma without fever or respiratory distress. However, clinically the chances of such a situation are remote. Out of 26 patients in the internal and 12 in the external group having coma, 24 and 11, respectively had associated fever and/or respiratory distress.

It is suggested that this scoring system can be used as a referral criteria at primary health centres. If the score is 4 or more, significant risks are to be anticipated and the patient should be transferred to a centre with facilities for advanced life-support. It seems that a score of  $\leq 7$  can fairly well predict that the patient is likely to survive and if the score is more than or equal to 8 the risk of death is several times more.

### Acknowledgement

The authors acknowledge the pool-scheme of CSIR, Government of India, New Delhi.

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### NOTES AND NEWS

#### RRPP ON RADIO/TELEVISION

In India, a vast majority of children are treated by doctors who have no formal training in Pediatrics. To improve the quality of care provided to our children, we have to reorient the doctors in rational pediatric practice. It is proposed to conduct RRPP (Reorientation in Rational Pediatric Practice) on radio and/or television. Like minded members should contact:

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