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Original Research Article

Prognostic value of laboratory and radiological parameters in kerosene poisoning

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ABSTRACT

Background: Kerosene poisoning, a commonly encountered situation in pediatric emergencies, caused varied systemic manifestations ranging from asymptomatic state to altered sensorium and cardiac arrhythmias. Gupta score has been traditionally used to prognosticate such cases. Limited number of studies have been done previously despite high incidence rates pertaining to laboratory and radiological features. Present study aimed to determine association between these features and outcome in terms of duration of stay.
Methods: A retrospective study consisted of all children presented with kerosene poisoning from May 2017 to May 2018. CBC was done within 12 hours of presentation and CXR was taken after 6 hours of exposure. These values were compared against duration of stay to predict prognosis.
Results: Most children were in age group of 1-3 years, male predominance 62.9%. Quantity of consumption didn't have any effect on outcome. Large proportion of children were asymptomatic 60%, followed by hurried breathing 31.5% - most frequent presenting complaint. Peak duration of consumption was 4 pm to 8 pm. CBC parameters- Hemoglobin status and WBC counts failed to have correlation with outcome in terms of duration of stay. CXR taken after 6 hours exposure- was imperative to predict outcome.
Conclusions: Radiological features on CXR in addition to clinical symptoms could be used to decide likely outcome after kerosene consumption.

Keywords: Gupta score, Haemoglobin, Kerosene, WBC counts

INTRODUCTION

Accidental kerosene ingestion is the commonest cause for poisoning and its elevated morbidity and mortality in children less than 5 years of age in developing countries.[1] Toxic potential of kerosene is due to its physical properties-high volatility, low viscosity and high surface tension.[2] Ingestion of >30ml of hydrocarbons is associated with increased risk of severe pneumonitis and ingestion of 1ml is significant.[3]

Clinical manifestations start from within 30 minutes and can progress over 24-48 hours and subside over next 1-2 weeks.[4]

Mortality and morbidity related to kerosene poisoning are due to pulmonary aspiration mainly because hydrocarbons cause chemical destruction of surfactant in alveoli, also cause increased permeability of vascular endothelium with subsequent diffuse hemorrhagic alveolitis and chemical pneumonitis.[4]

Patients developed complications even in absence of both vomiting and lavage, thus indicating blood absorption is also cause for toxicity.[5]

Neurological manifestations- usually seen in 1/3rd of patients in form of restlessness, convulsions, coma, visual disturbances, impaired memory and respiratory paralysis-

occurred to hypoxia gastrointestinal symptoms: vomiting, diarrhea, constipation and abdominal pain occurred due to mucosal irritation.[6,7] Hypoxemia on arrival, prior lavage, higher need for ventilation and higher frequency of secondary pneumonia and ventilator associated complications were associated with poor outcome.

The objectives of this study were: to determine prognosis of kerosene poisoning by laboratory and radiological parameters, to assess demographic details of children admitted with kerosene poisoning.

METHODS

Retrospective details of all children admitted in Vani Vilas hospital from May 2017 to May 2018 were collected.

Detailed history and clinical examination were done for all children. All were subjected to investigations CBC within 12 hours of presentation and CXR after 6 hours of consumption and treated according to hospital protocols. Children were divided based on age into 3 groups- toddlers 1-3 years, preschool 4-5 years, school older than 5 years. According to hemoglobin status- children were classified as normal- Hb >11gm/dl, mild anemia-10 to 11gm/dl, moderate anemia-7 to 9gm/dl, severe anemia- less than 7gm/dl. Similarly, WBC counts were categorized into 3 groups as leukopenia-less than 5000/cumm, normal-5000 to 15000/cumm and leukocytosis- more than 15000/cumm.

Inclusion criteria

- All children who presented with history of kerosene consumption between ages of 1 to 18 years from May 2017 to May 2018.

Statistical analysis

The data obtained was tabulated on Microsoft Excel spreadsheet and then extrapolated to SPSS. The categorical data was expressed as ratios and percentages. Continuous data was expressed as mean±standard deviation (SD).

Comparison of mean was done by ANOVA test assuming unequal distribution between groups. At 95% confidence interval (CI), a probability value ('p' value) of less than or equal to 0.050 was considered to be statistically significant.

RESULTS

Incidence of childhood kerosene poisoning is much higher than documented as there are no standard systems for reporting cases of accidental poisoning; secondly all the available data are hospital-based data which may not be a true representative of the community at large.

Moreover, many cases from rural areas may never get reported in a hospital due to ignorance, illiteracy, non-availability of primary health centres and of transport difficulties.

Table 1: Clinical profile of children.

N=35	Minimum	Maximum	Mean	SD
Age (years)	1.0	18.0	3.651	3.6412
Weight (kgs)	7.0	45.0	12.714	7.7405
Length or height (cm)	70	170	92.49	19.574
Quantity (ml)	5	50	20.29	14.397
Time gap (hours)	0	30	6.11	8.163
Haemoglobin (gm/dl)	6.10	15.60	10.819	2.016
WBC counts (per cumm)	4400	28500	15545.71	6413.6
Neutro count (%)	22	88	61.09	18.139
Duration of stay (days)	1	12	3.14	2.534
Gupta score	0	5	1.46	1.804

Descriptive frequencies of various parameters taken at start of study before statistical analysis.

65.7% children were toddlers, accounting for majority of cases, 62.9% children were males.

Most cases were clustering around line drawn indicating positive correlation, but P value more than 0.05 indicated no statistical significance.

60% children were asymptomatic at presentation followed by hurried breathing-31.5% children. 74.3% children had normal nutritional status, while only 20% and 5.4% had moderate and severe acute malnutrition.

Most cases occurred between 2 pm to 8 pm.

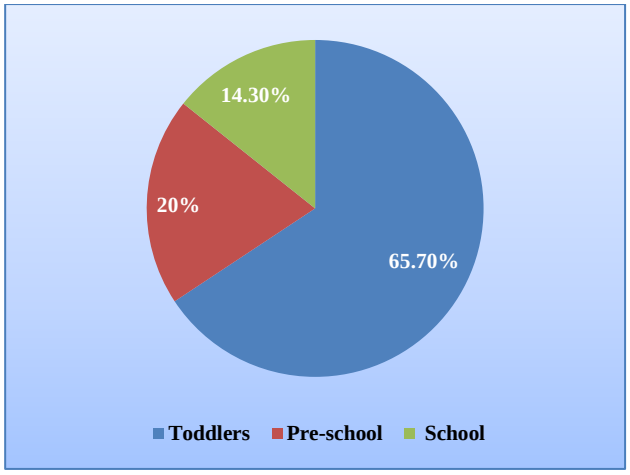


Figure 1: Age distribution.

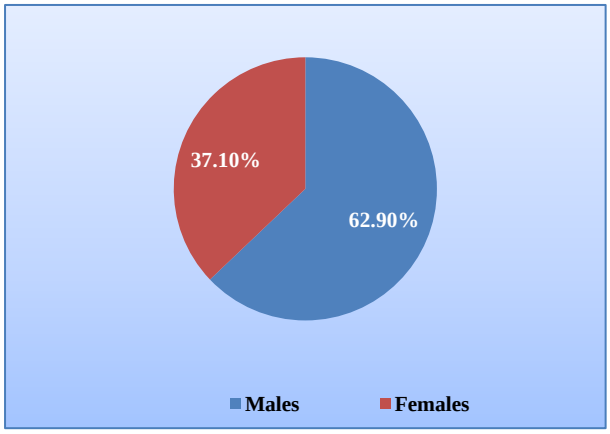
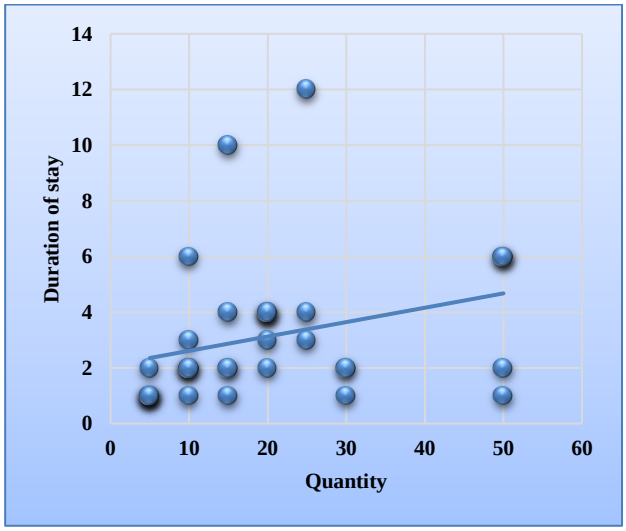


Figure 2: Gender distribution.



R= 0.293 P= 0.087 Pearson correlation

Figure 3: Scatter plot depicting correlation between quantity consumed and duration of stay.

48.6% children had normal hemoglobin, while 31.4% had mild anemia. No statistical significance when hemoglobin status compared against duration of stay.

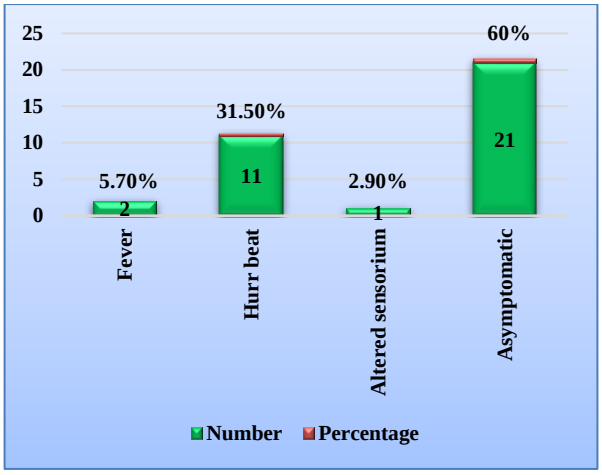


Figure 4: Presenting complaints.

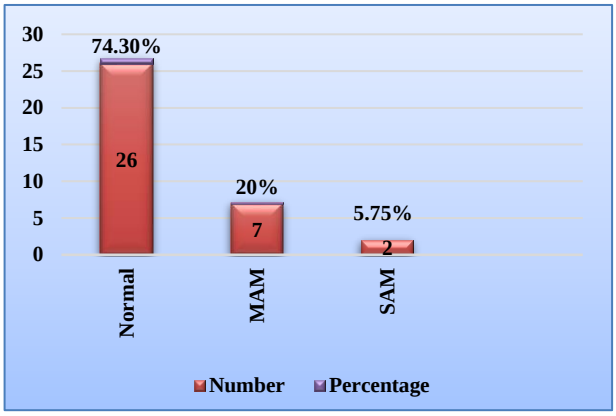


Figure 5: Nutrition status.

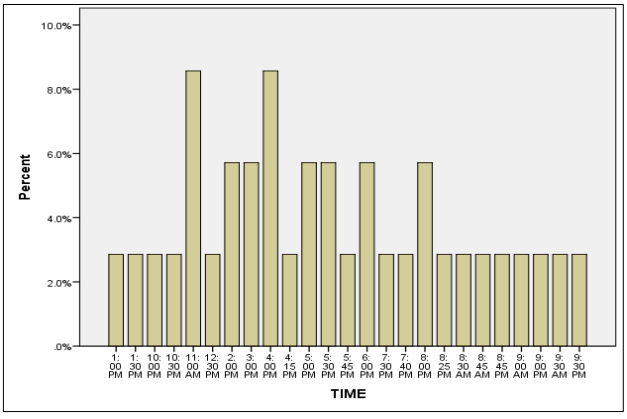


Figure 6: Relation between number of cases and time of consumption.

Table 2: Hemoglobin status vs duration of stay.

N=35	Number	Percent	Mean	SD
Normal	17	48.6	3.47	3.145
Mild anemia	11	31.4	1.73	0.905
Mod anemia	6	17.1	4.87	1.633
Sev anemia	1	2.9	4.00	-

P= 0.106 ANOVA

Table 3: WBC counts vs duration of stay.

N=35	Number	Percent	Mean	SD
Leucopenia	2	5.7	3.50	3.536
Normal	16	45.7	2.63	2.391
Leucocytosis	17	48.6	3.59	2.647

P=0.554 ANOVA

48.6% children had leucocytosis while 45.7% had normal leucocyte counts. Again, no statistical significance when compared against duration of stay.

Table 4: CXR vs duration of stay.

N=35	Number	Percent	Mean	SD
Normal	23	65.7	1.87	0.920
Single patch	8	22.9	4.13	1.356
Multiple patch	2	5.7	6.00	0.000
ARDS	2	5.7	11.00	1.414

P= 0.000 ANOVA

A 65.7% had chest X-ray while 22.9% had single patch. Similarly, 2 % children had multiple patches and ARDS picture on CXR. However, CXR features taken after 6 hours had statistically significant association with duration of stay.

DISCUSSION

Age and gender distribution

Age distribution from present study is in agreement with other studies. Accidental poisoning is confined mainly to age group of 1-3 years, because children in this age group are more curious in nature, aided by their newly acquainted hand skills and mobility. Only few cases, 14.3% occurred in older children >5 years, presumably because children of this age group are more selective and discriminative about their eating and drinking habits. Similarly, infants are affected less, because of their inability and probably more attention by mothers.

Table 5: Various studies on kerosene poisoning.

Author	Study details	N	Age	Gender
Present study	Retrospective, May 2017-May 2018, Bangalore, India	35	65.7% in toddlers	62.9% males
Jayashree et al[1]	Retrospective, January 1995 -December 2001, Chandigarh, India	48	94% in less than 5 years	77.35%males
Gupta et al[3]	Retrospective, 1992, India	70	70% in less than 2 years	64% males
Naddawi et al[8]	Prospective, January - august 2008, IRAQ	50	86% in toddlers	62% males
Abdelmonem et al[9]	Prospective, February 2013-January 2014, Egypt	72	76.4% in less than 5 years	56.9% males
Anwar et al[10]	Retrospective, January -June 2010	56	93% in toddlers	51.8% males

Male preponderance was evident in most of the studies except in studies done by Gango et al, Singapore and Fazen et al, which reported equal incidence. Predominance in males could be explained by their natural tendency to be more exploratory, active ad restless than their female counterparts. [11,12]

Quantity consumed

Amount of kerosene ingested had correlation of 0.293 on Pearson's plot, however, was not significant with P value of 0.087. Amount consumed was not chosen as reliable marker in many studies as more than 30mL was hardly ever consumed because of bad odor; difficulty in quantification of amount spilled. Amount >30mL is associated with severe pneumonitis.

Time of consumption

In present study, peak duration of consumption was at 11.00 am and 4pm. A 42.8% incidents happened during evening hours 4.00 pm to 8.00 pm.

It was in accordance with studies done in Northern Jordan by Abuekteish et al and in Greater Athens by Petridou et al.[13,14]

Clinical parameters in children- prognstic importance

Gupta et al, in 1992 studies 70 children retrospectively, formulated a prognostic score which consisted of fever, severe malnutrition, respiratory distress and neurological symptoms.[2] Predictive value of prognostic score was 85.7%. For validation, this score was applied to 20 children and 84% of the cases could be correctly predicted. Similarly, Abdel Rauf et al, in 2012, carried out a study in 70 cases, test group 50 cases and confirmatory group 20 cases and suggested a prognostic score which included RD, pulmonary involvement, CNS manifestations, PaO_2 levels, cyanosis and vomiting.[15]In present study, 60% was asymptomatic, 31.5% had hurried breathing and only 2.9% had altered sensorium. Our findings matched with studies conducted by Naddawi et al, Anvar et al, and Jayashree et al.[1,8,11]

Abdelmonem et al, in his study showed higher incidence of CNS manifestation, drowsiness 11.1%, agitation 2.8%.[9] A 75% had SAM, 20% had MAM, while 74.3%v were normal. Importance of nutrition status was highlighted previously by Gupta et al.[2]

Laboratory parameters in children-prognostic importance

No previous studies have been conducted pertaining to laboratory parameters as prognostic markers except for PO_2 levels from ABG. In present study, authors chose CBC done at time of presentation within 12 hours of admission to compare with duration of stay.

CBC remains available in all health centres, at all times. Hemoglobin status compared did not prove to have significant association with outcome. Similarly, WBC counts didn't have predictive value statistically.

Radiological parameters in children-prognostic importance

Present study showed 65.7% children had normal X-ray, while 34.3% had abnormal x-ray on CXR taken 6 hours after consumption. It could predict outcome in terms of duration of stay.

Therefore, from present study authors could tell that if CXR abnormality in the film taken after 6 hours exposure, such patients are likely to have prolonged hospital stay, hence require intense monitoring at the start. Naddawi et al and Jayashree et al, showed B/L lower lobe infiltration as most common abnormality on CXR.[1,8]

Khanna et al, (2014) from Vallabhai Patel Chest Institute, New Delhi and Thalhammer et al (2005) Austria predicted poor correlation between clinical symptoms and CXR findings.[4,16] They recommended that the decision for hospitalization be based on clinical criteria, rather than X-ray findings alone.

CXR taken 6 hours after admission, along with clinical prognostic scores suggested by Gupta et al, and Rauf A et al, predict outcome of patients.[2,16]

CONCLUSION

Kerosene poisoning is a prevalent household accidental toxic hazard among male children under 3 years. Patients must be monitored both clinically and radiologically to recognize potential pulmonary complications.

In a scare resource country like ours, present study could definitely help in prioritizing patients and effectively select patients for intensive monitoring. Laboratory parameters like Haemoglobin status of child and leucocyte count failed to have any bearing on outcome.

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