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Survey of clinical and paraclinical Prevalence of symptoms in Patients with Hydrocarbons Poisoning referred to pediatrics emergency room in southeast iran

Authors:
Elham Shafighi Shahri[1], Jalal Addin Rezaei[2], Somaye Talaeepur[3]*
[1] Children and Adolescents Health Research Center,Research Institute of Cellular and Molecular Science in Infectious Diseases,Zahedan University of Medical Sciences,Zahedan,Iran.
[2]medical student zahedan university medical sciences
[3]Children Growth Disorder Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran
Corresponding Author:
Somaye Talaeepur
Children Growth Disorder Research Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

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ABSTRACT:

Introduction and Objective: The incidence of poisoning is high in developed countries and is increasing in developing nations. Hydrocarbon aspiration affects the respiratory and central nervous systems. Most patients exposed to aliphatic hydrocarbons (such as kerosene and pine oil) are children who initially show no symptoms but have a history of exposure. This study aimed to investigate the frequency of clinical and paraclinical symptoms of hydrocarbon poisoning in the pediatric emergency department of Ali Ibn Abi Talib Hospital, Zahedan. **Materials and Methods**: This descriptive-analytical cross-sectional study was conducted on 73 hospitalized pediatric cases of hydrocarbon poisoning. Data were collected from medical records meeting inclusion criteria and entered into a checklist. Statistical analysis was then performed. **Findings**: Of the patients, 69.9% (51 individuals) were male, and 30.1% (22 individuals) were female. The youngest age was 12 months (1 year), and the oldest was 168 months (14 years), with a mean age of 58.26 ± 10.26 months (predominantly at age 2). Of the cases, 2.7% were poisoned with gasoline, 95.9% with kerosene, and 1.4% with oil. Kerosene was the most common cause. Clinical symptoms included cough (63%), shortness of breath (31%), fever (23.3%), and respiratory distress (28.8%), with cough being the most frequent symptom. None of the patients exhibited jaundice or edema. Paraclinical findings revealed that 13.7% developed pneumonia post-poisoning, 11% showed abnormal chest X-rays, and 4.1% had elevated ESR and CRP. Leukocytosis was observed in 68.5%, while liver and kidney function tests were normal. Additionally, 13.7% experienced reduced consciousness, with supportive care provided to 72.6%, and 27.4% receiving antibiotics. One patient died. **Conclusion**: Hydrocarbon poisoning was more prevalent in males and at a mean age of 58.26 months. Kerosene was the most common hydrocarbon involved. Cough and shortness of breath were the primary clinical symptoms, and leukocytosis was the most common paraclinical finding. The mortality rate was low, with one death recorded in this study.

Keywords: Hydrocarbons, Poisoning, Symptoms

INTRODUCTION:

A poison is a substance that can cause damage or death to an organism, and poisoning refers to the event during which the body absorbs a toxic substance through ingestion, inhalation, skin contact, or injection. This process leads to a series of symptoms that can cause harm or pose a threat to life.

Toxicology is a branch of medical science that deals with the biochemical effects of drugs and toxins and the clinical manifestations caused by them. Poisoning has always been a significant public health issue, constituting 15-20% of emergency cases. Poisoning in children is a common occurrence and a major cause of hospital admissions and fatalities among this group. More than 50% of all poisoning cases occur in children under the age of 5, 88% of which are accidental and 92% take place at home.

The prevalence of poisoning is high in developed countries and rising in developing nations. In the United States, approximately 8.2 million cases of poisoning occur annually, of which 1.6 million involve children. In Iran, studies have identified the leading causes of poisoning as pharmaceuticals, including narcotics (42%), kerosene (31%), and food poisoning (10.9%). Most poisoning incidents in Iran involve children under 5 years of age.

Comprehensive information about the chemical substances involved in pediatric poisoning, including

hydrocarbons, is essential. Hydrocarbons are a significant cause of poisoning in young children, as identified in various studies.

Hydrocarbons are a diverse group of organic compounds composed mainly of carbon and hydrogen atoms, categorized into aliphatic and aromatic groups. Most hydrocarbons are derived from crude oil distillation, which produces mixtures with varying chain lengths. Gasoline, for instance, contains approximately 80% saturated and unsaturated aliphatic hydrocarbons with chain lengths of C4 to C10 and 20% aromatic hydrocarbons. Hydrocarbon poisoning most commonly occurs with medium-chain compounds.

Respiratory toxicity due to hydrocarbon aspiration is the most common complication of ingesting linear hydrocarbons. Pine-derived products (e.g., turpentine and oils) contain hydrocarbon derivatives that are more readily absorbed via the gastrointestinal tract than aliphatic hydrocarbons, increasing the risk of central nervous system (CNS) depression.

Aromatic and halogenated hydrocarbons are other categories that can lead to poisoning, primarily through inhalation. These compounds can cause significant effects on the CNS, heart, liver, kidneys, and blood. The toxic potential of hydrocarbons depends on their physical properties (volatility, viscosity, and surface tension), chemical characteristics (aliphatic, aromatic, halogenated), the presence of additives (e.g., pesticides or heavy metals), the method of exposure, and the concentration or dose.

The clinical manifestations of hydrocarbon poisoning vary widely and may include respiratory, neurological, cardiovascular, gastrointestinal, and hematological symptoms. Diagnostic approaches often rely on clinical findings, as specific laboratory tests are not always readily available.

This study aims to evaluate the clinical and paraclinical features of hydrocarbon poisoning in children presenting to the emergency department of Ali Ibn Abi Talib Hospital, Zahedan, during a two-year period. By identifying the clinical patterns of hydrocarbon poisoning in this age group, the study seeks to contribute to early diagnosis, prevention, and management strategies to reduce morbidity and mortality.

METHODOLOGY:

This was a descriptive-analytical cross-sectional study.The study population included all patients under 18 years of age presenting to the pediatric emergency department of Ali Ibn Abi Talib Hospital, Zahedan, diagnosed with hydrocarbon poisoning

Inclusion Criteria:

- Age under 18 years.
- Presentation within 6-8 hours of exposure.

Exclusion Criteria:

- Incomplete medical records.
- Lack of access to the patient for data collection.
- History of chronic illnesses.

Data, including demographic information (age, gender, residence), hydrocarbon type, clinical symptoms, length of hospital stay, treatment methods, and outcomes, were recorded in a checklist for each patient.A census of 73 medical records was conducted over the specified period.

Study Procedure:

After ethical approval and adherence to the Helsinki Declaration, medical records of patients meeting inclusion criteria were reviewed. Data were analyzed using SPSS software, with descriptive and inferential statistics applied. A p-value of <0.05 was considered significant.

Ethical Considerations:

This study adhered to the ethical guidelines for research involving human subjects, as outlined by the Ministry of Health and Medical Education of Iran with code IR. ZAUMS. REC.1396.323.

FINDINGS:

69.6% (51) males and 30.1% (22) females were poisoned by hydrocarbons during the present study .The youngest age of the poisoned patients was 12 months (1 year) and the oldest was 168 months (14 years). The mean age was (26.58±26.10) (mostly this occurred at the age of 2 years).

In the present study, 2.7% were poisoned by gasoline, 95.9% by petroleum, and 1.4% by oil. The most common poisoning in this study was with petroleum.

Table 1: frequency of hydrocarbon poisoning by type of hydrocarbon

%	Number	Kind of hydrocarbon
2.7	2	gasoline
95.9	70	kerosene
1.4	1	Oil
100	73	all

In the present study, 31.5% of children (23) had shortness of breath, 63% (46) had cough, 23.3% (17) had fever, and 28.8% (21) had respiratory distress and showed these symptoms. The most common clinical symptom was cough, followed by shortness of breath. In addition, none of the patients showed jaundice or edema.

In this study, 13.7% of patients developed post-poisoning pneumonia (10 patients). In this study, 11% (8 patients) had CXR involvement and 4.1% (3 patients) of participants had increased ESR and CRP. 68.5% (50 patients) had leukocytosis. Also, in this study, none of the patients had abnormal LFT tests and none showed liver or kidney involvement.

In this study, 13.7% of people had decreased level of consciousness following hydrocarbon poisoning. In the present study, 72.6% of participants received supportive care, but 27.4% (20 patients) received antibiotic treatment.

Table 2: frequency of lab tests and symptoms of hydrocarbon poisoning

%	Number	
4.1	3	Increased ESR
4.1	3	Increased CRP
11	8	CXR involvement
13.7	10	Pneumonia
68.5	50	Leukocytosis
13.7	10	LOC

In this study, most participants completed the treatment completely (52.1%), while 46.6% left the treatment incomplete with personal consent. Meanwhile, we witnessed 1 death (1.4%) among 73 patients with poisoning.

In gender assessment by type of poisoning: In males, 96.1% had oil poisoning (49 people) and 3.9% (2 people) had gasoline poisoning. Also, no oil poisoning was observed in this gender. In females, 95.5% (21 people) had oil poisoning and 4.5% (1 person) had oil poisoning. And no gasoline poisoning was observed in this group. In this study, in males, 31.4% (16 people) had shortness of breath. Also, 31.8% (7 people) of females had shortness of breath following poisoning.

In males: 62.7% (32 people) had cough following poisoning, 23.5% (12 people) fever , 29.4% (15 people) respiratory distress, 5.9% had increased ESR, 5.9% increase in CRP, 11.6% (6 people) had CXR involvement, 72.5% (37 people) had leukocytosis and 13.7% (7 people) had pneumonia .

In females: 63.6% (14 people) cough, 22.7% (5 people) fever, 27.3% (6 people) had respiratory distress following poisoning. : No increase in ESR and CRP, .9% (2 people) had CXR involvement after poisoning . 59.1% (13 people) had leukocytosis and 13.6% (3 people) had pneumonia

Under 24 months of age: 3.9% (2 people) were poisoned by gasoline, 94.1% (48 people) were poisoned by oil, and 2% (1 person) were poisoned by oil. Under 24 to 48 months of age: 100% of cases (17 people) were poisoned by oil. Over 4 years of age: 100 cases (5 people) were poisoned by oil .

Under 24 months had 33.3% (17 people) had shortness of breath, 66.7% (34 people) cough, 19.6% (10 people) respiratory distress, % (1 person) had an increased ESR and 2% (1 person) an increased CRP. 11.8% (6 people) had CXR involvement. : 64.7% (33 people) had leukocytosis. 11.8 percent (6 people) developed pneumonia and 19.6 percent (10 people) developed decreased level of consciousness

24 to 48 months had 23.5% (4 people) had shortness of breath, 58.8% (10 people) cough, 29.4% (5 people)) had respiratory distress., 5.9% (1 person) had an increased ESR and 25.9% (1 person) had an increase in CRP. : 5.9% (1 person) had CXR involvement: 76.5% (13 people) had leukocytosis had leukocytosis. 11.8 percent (6 people) developed pneumonia and : No decreased level of consciousness was observed

Over 4 years of age had 40% (2 people) had shortness of breath, 40% (2 people) cough, 40% (2 people) respiratory distress., , 20% (1 person) had an increased ESR.and 20% (1 person) had an increase in CRP. 20% (1 person) had CXR involvement.had 80% (4 people) had leukocytosis . 40 percent (2 people) developed pneumonia and : No decreased level of consciousness was observed

DISCUSSION:

69.69% (51) males and 30.1% (22) females were poisoned by hydrocarbons during the present study. In the study by Matityahu Lifshitz, which was conducted on 274 patients, 61% (168) were male and 39% (106) were female (6). Also, in the study by Sunit Singhi on children's poisoning with hydrocarbons, the male to female ratio was 3.4 to 1 (49). These studies are completely consistent with our studies. According to the results, it shows a gender superiority of males in hydrocarbon poisoning over females.

The youngest age of the patients with poisoning was 12 months (1 year) and the oldest was 168 months (14 years). The mean age was (26.58±26.10) (most of this occurred at the age of 2 years). In the Siddiqui EU study, most of the children were between 2 and 5 years of age (45). Also, in the Sunit Singhi study, 94% of the poisoned children were under 5 years of age (49). Also, in the study by Ali M. Shotar MD et al. on children poisoning with hydrocarbons, most of the children were under 2 years of age (50). These studies were in line with our study.

In the present study, 2.7% were poisoned with gasoline, 95.9% were poisoned with oil, and 1.4% were poisoned with oil. The most poisoned in this study was oil. In the Siddiqui EU study on factors related to hydrocarbon consumption in children, petroleum products (88%) were the most consumed hydrocarbons (45). Also, in the study by Lifshitz M, 96% of patients (263) were poisoned by kerosene, and the remaining 4%, 8 children, consumed gasoline, and 3 children were poisoned by acetone (6). Also, in the study by Kushanfar et al., investigating the causes of poisoning in children under 12 years of age at Loghman Hakim Hospital, the results are as follows: The most common cause of poisoning was drug poisoning (45%). In second place was oil (617 cases), and in third place were bleaching and detergents (242 cases) (51). In these studies, as in our study, the highest number of poisonings occurred with oil. The reason for this is the availability of this substance compared to other substances among children.

In the present study, 31.5% of children (23) had shortness of breath, 63% (46) had cough, 23.3% (17) had fever, and 28.8% (21) had respiratory distress and showed these symptoms. The most common clinical symptom was cough, followed by shortness of breath. In addition, none of the patients showed jaundice or edema. In the study by Ali M. Shotar MD, the most common symptom was cough (67.2%), followed by tachycardia (56.5%), fever (54.1%), vomiting (27.8%), and restlessness (35.2%) (50). This study was consistent with our study in terms of the high

prevalence of cough, but in most studies, fever can be observed as a finding with high prevalence (42, 52). Also, in the study by Matityahu Lifshitz, fever (63.5%), vomiting (51.1%), cough (38%), tachycardia (73.7%) were observed as the most common symptoms, and rales (34.3%) were observed (6). This study was slightly different from our study in terms of the prevalence of clinical symptoms. This difference can be traced to the person examining the patients and the type of substance consumed and its amount. Also, in the study by Sachin S Hatti, the most common finding was vomiting with 67.3%, respiratory distress with 57%, cough with 46%, and fever with a prevalence of 28.8% (44). This study was consistent with our study in terms of the prevalence of fever. Also, in the study by G.R. BOND et al., like our study, none of the children showed edema and jaundice as clinical findings (53).

CONCLUSION:

Overall, the prevalence of hydrocarbon poisoning was more common in males and the mean age was (26.58±26.10) months. The most common poisoning was with oil and the most common initial symptom in patients was cough followed by shortness of breath. Also, the most common paraclinical finding in this study was leukocytosis. In the overall study, a 13.7% decrease in the level of consciousness was observed. And one patient died.

Although hydrocarbon poisoning in children has decreased worldwide, in our study area, due to fuel smuggling and socioeconomic levels, we still see many cases of hydrocarbon poisoning in children. After the government comes up with a solution to this problem, families should be educated not to place hydrocarbons within the reach of children.

REFERENCES:

1. Mert E, Bilgin NG. Demographical, aetiological and clinical characteristics of poisonings in Mersin, Turkey. Human & experimental toxicology. 2006;25(4):217-23.
2. Riordan M, Rylance G, Berry K. Poisoning in children 1: general management. Archives of disease in childhood. 2002;87(5):392-6.
3. Curtis J, Metheny E, Sergent SR. Hydrocarbon toxicity.
4. Hoffman RJ, Osterhoudt KC. Evaluation and management of pediatric poisonings. Pediatric case reviews (Print). 2002;2(1):51.
5. Talebian A, Doroodgar A, Salehi I, Akbari H. Epidemiologic study of poisoning in children admitted at Shaheed Beheshti Hospital of Kashan during 1997-2001. KAUMS Journal (FEYZ). 2006;10(2):46-9.
6. Lifshitz M, Sofer S, Gorodischer R. Hydrocarbon poisoning in children: a 5-year retrospective study. Wilderness & environmental medicine. 2003;14(2):78-82.
7. Ma OJ, Cline D, Tintinalli J, Kelen G, Stapczynski J. Emergency medicine manual: McGraw-Hill New York; 2004.
8. Hoffman RS, Nelson LS, Howland MA, Lewin NA, Flomenbaum NE, Goldfrank LR. Goldfrank's manual of toxicologic emergencies: McGraw Hill Professional; 2007.
9. Meckler G, Quereshi N, Al-Mogbil M, Kentab O. Tintinalli's emergency medicine: a comprehensive study guide: New York: McGraw-Hill; 2016.
10. Primm PA. Hydrocarbon aspiration in children and adolescents.
11. Bronstein AC, Spyker DA, Cantilena JR M, PhD, Louis R, Green JL, Rumack BH, Giffin SL. 2009 annual report of the American association of poison control centers' national poison data system (NPDS): 27th annual report. Clinical Toxicology. 2010;48(10):979-1178.
12. Jolliff HA, Fletcher E, Roberts KJ, Baker SD, McKenzie LB. Pediatric hydrocarbon-related injuries in the United States: 2000–2009. Pediatrics. 2013:peds. 2012-3913.
13. Mowry JB, Spyker DA, Cantilena Jr LR, McMillan N, Ford M. 2013 annual report of the American association of poison control centers' National poison data system (NPDS): 31st annual report. Clinical toxicology. 2014;52(10):1032-283.
14. Shannon MW, Borron SW, Burns M. Haddad and Winchester's clinical management of poisoning and drug overdose. System. 2007;133:1.
15. Tormoehlen L, Tekulve K, Nanagas K. Hydrocarbon toxicity: a review. Clinical toxicology. 2014;52(5):479-89.
16. Flomenbaum NE. Goldfrank's Toxicologic Emergencies. 2006: New York: McGraw Hill; 2006.
17. Khine H, Weiss D, Graber N, Hoffman RS, Esteban-Cruciani N, Avner JR. A cluster of children with seizures caused by camphor poisoning. Pediatrics. 2009;123(5):1269-72.
18. Welker JA, Zaloga GP. Pine oil ingestion: a common cause of poisoning. Chest. 1999;116(6):1822-6.
19. Dinwiddie SH. Abuse of inhalants: a review. Addiction. 1994;89(8):925-39.
20. McHugh MJ. The abuse of volatile substances. Pediatric Clinics of North America. 1987;34(2):333-40.
21. Gurwitz D, Kattan M, Levison H, Culham J. Pulmonary function abnormalities in asymptomatic children after hydrocarbon pneumonitis. Pediatrics. 1978;62(5):789-94.

22. Ellenhorn MJ, Schonwald S, Ordog G, Wasserberger J. Ellenhorn's medical toxicology: diagnosis and treatment of human poisoning: Williams & Wilkins Baltimore; 1997.
23. Prasad R, Karmakar S, Sodhi R, Karmakar S. Bilateral hemorrhagic pleural effusion due to kerosene aspiration. Lung India: official organ of Indian Chest Society. 2011;28(2):130.
24. Bergeson PS, Hales SW, Lustgarten MD, Lipow HW. Pneumatoceles Following Hydrocarbon Ingestion: Report of Three Cases and Review of the Literature. American Journal of Diseases of Children. 1975;129(1):49-54.
25. Thalhammer GH, Eber E, Zach MS. Pneumonitis and pneumatoceles following accidental hydrocarbon aspiration in children. Wiener klinische Wochenschrift. 2005;117(4):150-3.
26. Lietman PS, Wolfsdorf J. Kerosene intoxication: an experimental approach to the etiology of the CNS manifestations in primates. The Journal of pediatrics. 1976;88(6):1037-40.
27. Lewander WJ, Aleguas Jr A, Pharm B. Hydrocarbon poisoning.
28. Banner Jr W, Walson P. Systemic toxicity following gasoline aspiration. The American journal of emergency medicine. 1983;1(3):292-4.
29. Anas N, Namasonthi V, Ginsburg CM. Criteria for hospitalizing children who have ingested products containing hydrocarbons. JAMA. 1981;246(8):840-3.
30. Arena JM. Hydrocarbon poisoning-current management. Pediatric annals. 1987;16(11):879-83.
31. Shannon M. Ingestion of toxic substances by children. New England Journal of Medicine. 2000;342(3):186-91.
32. Benson B, Hoppu K, Troutman W, Bedry R, Erdman A, Höjer J, et al. Position paper update: gastric lavage for gastrointestinal decontamination. Clinical toxicology. 2013;51(3):140-6.
33. Vale J, Kulig K. Position paper: gastric lavage. Journal of toxicology Clinical toxicology. 2004;42(7):933-43.
34. Zucker AR, Berger S, Wood LD. Management of kerosene-induced pulmonary injury. Critical care medicine. 1986;14(4):303-4.
35. Bysani GK, Rucoba RJ, Noah ZL. Treatment of hydrocarbon pneumonitis: high frequency jet ventilation as an alternative to extracorporeal membrane oxygenation. Chest. 1994;106(1):300-3.
36. Liebelt EL, Deangelis CD. Evolving trends and treatment advances in pediatric poisoning. JAMA. 1999;282(12):1113-5.
37. Scalzo AJ, Weber TR, Jaeger RW, Connors RH, Thompson MW. Extracorporeal membrane oxygenation for hydrocarbon aspiration. American Journal of Diseases of Children. 1990;144(8):867-71.
38. El-Bahnasawy MM, Mohammad AE-H, Morsy TA. Hydrocarbon insecticides: their risks for environment and human health. Journal of the Egyptian Society of Parasitology. 2014;240(1416):1-12.
39. Marks MI, Chicoine L, Legere G, Hillman E. Adrenocorticosteroid treatment of hydrocarbonpneumonia in children—a cooperative study. The Journal of pediatrics. 1972;81(2):366-9.
40. Steele RW, Conklin RH, Mark HM. Corticosteroids and antibiotics for the treatment of fulminant hydrocarbon aspiration. JAMA. 1972;219(11):1434-7.
41. Horoz O, Yildizdas D, Yilmaz H. Surfactant therapy in acute respiratory distress syndrome due to hydrocarbon aspiration. Singapore Med J. 2009;50(4):e130-3.
42. Nagi N, Abdulallah Z. Kerosene poisoning in children in Iraq. Postgraduate medical journal. 1995;71(837):419-22.
43. Makrygianni EA, Palamidou F, Kaditis AG. Respiratory complications following hydrocarbon aspiration in children. Pediatric pulmonology. 2016;51(6):560-9.
44. Hatti SS, Uplaonkar V, Honnalli C. Hydrocarbon poisoning in children: 1-year retrospective study. Indian Journal of Child Health. 2018;5(3):193-5.
45. Siddiqui E, Razzak J, Naz F, Khan SJ. Factors associated with hydrocarbon ingestion in children. Journal of the Pakistan Medical Association. 2008;58(11):608.
46. SH M, N B. Poisoning in children admitted to the emergency ward of Rasht 17 Shahrivar Hospital: a brief report. Tehran Univ Med J. 2012; 70 (1) :64-67
48. Marandian M, Sabouri M, Youssefian H, Behvad A, Djafarian M, editors. Pneumatoceles and pneumothorax following accidental hydrocarbon ingestion in children. A study of 50 cases in Iran (author's transl). Annales de pediatrie; 1981.
49. Jayashree M, Singhi S, Gupta A. Predictors of outcome in children with hydrocarbon poisoning receiving intensive care. Indian pediatrics. 2006;43(8):715.

50. Shotar AM. Kerosene poisoning in childhood: A 6-year prospective study at the Princes Rahmat Teaching Hospital. Neuroendocrinology letters. 2005;26(6):835-8.
51. Koshanfar, Akbar. "Investigation of causes of poisoning in children under 12 years of age at Loghman Hakim Hospital, 1997." Pajouhandeh. Spring 2002, Volume 7, Number 1 (27 in a row); from page 71 to page 73
52. Gerarde HW. Toxicological studies on hydrocarbons: IX. The aspiration hazard and toxicity of hydrocarbons and hydrocarbon mixtures. Archives of Environmental Health: An International Journal. 1963;6(3):329-41.
53. WHO EMRO Pediatric Hydrocarbon Study Group C, Egypt, Bond G, Pièche S, Sonicki Z, Gamaluddin H, Guindi ME, et al. A clinical decision rule for triage of children under 5 years of age with hydrocarbon (kerosene) aspiration in developing countries. Clinical Toxicology. 2008;46(3):222-9.