International Journal of Health Sciences and Research
[Indexed, Peer-Reviewed Journal]
Volume 16; Issue: 5; May 2026
Website: www.ijhsr.org
Original Research Article *ISSN: 2249-9571*

Acute Accidental Chlorine Gas Exposure in Yadavagiri, Mysuru: A Cross-Sectional Study

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DOI: https://doi.org/10.52403/ijhsr.20260523

ABSTRACT

Introduction: Chlorine is a widely used industrial chemical that may cause significant toxicity when released into the environment. Exposure risk depends on proximity to the source and may occur via inhalation, skin, or ocular contact. On March 7, 2022, a chlorine gas leak occurred in Yadavagiri, Mysuru, leading to acute health effects among nearby residents.
Objectives: To assess the health effects of chlorine gas exposure among residents affected by the Yadavagiri gas leak incident.
Materials and Methods: A cross-sectional study was conducted among individuals exposed to the chlorine gas leak. Participants were recruited using a snowball sampling technique. A total of 29 victims were interviewed using a pre-tested structured questionnaire. Clinical data were also extracted from hospital records of patients admitted to a tertiary care centre following exposure. Data was entered in Microsoft Excel and analysed using appropriate statistical methods.
Results: Out of the 29 victims, 21 (72.41%) had cough, 16 (55.17%) suffered from breathlessness. Other symptoms included throat irritation, blurring of vision, giddiness and vomiting. The systemic examination revealed rhonchi 1(3.4%) and tachycardia 16(55.17%). All the victims who were admitted were given oxygen supplementation, antibiotics and corticosteroids.
Conclusion: Although chlorine gas exposure in residential areas is uncommon, such incidents can lead to significant acute morbidity. Prompt emergency response, proper training of personnel handling hazardous substances, and community awareness regarding emergency preparedness are essential to mitigate health impacts.

Keywords: Chlorine; exposure; dyspnoea; accidental

INTRODUCTION

Chlorine (Cl_2) is a yellow-green gas with a pungent, irritating odour. It is slightly soluble in water, approximately two to three times heavier than air, and acts as a strong oxidizing agent (1). Although no longer widely used as a chemical warfare agent (2), chlorine remains extensively utilized in industrial processes (3), including as a reagent or by-product in chemical manufacturing, bleaching of textiles and paper, and water purification. Human

exposure to toxic levels of chlorine is typically accidental (4), most commonly resulting from leaks during storage, transport, or industrial handling. Due to its higher density than air, chlorine tends to accumulate near ground level, thereby increasing the risk and duration of exposure, particularly in enclosed or low-lying areas (2).

The severity of chlorine-induced injury depends on the concentration of the gas, duration of exposure, and the moisture content of the exposed tissues. Chlorine primarily affects the respiratory system, but involvement of the gastrointestinal, ophthalmic, and cutaneous systems has also been reported. Common clinical manifestations include lacrimation, rhinorrhoea, conjunctival irritation, cough, sore throat, laryngeal oedema, dyspnoea, hoarseness, and, in severe cases, stridor (5). Acute effects such as tracheitis, cough, and transient dyspnoea occur rapidly following exposure. However, long-term pulmonary sequelae may develop, including chronic cough with wheezing and persistent breathlessness. Individuals with pre-existing respiratory conditions such as asthma, allergic bronchitis, or a history of smoking may experience more severe outcomes (6). Severe exposure can lead to complications such as pulmonary oedema (7), acute respiratory distress syndrome (ARDS) (8), respiratory failure, and death.

On March 7, 2022, at approximately 3:00 PM, a chlorine gas leak occurred from a cylinder installed in a park adjacent to the Railway Loco Colony, opposite Vani Vilas Water Works (VVWW), KRS Road, Yadavagiri, Mysuru. These cylinders were used for water purification. The leakage occurred due to a valve failure and was subsequently controlled by VVWW personnel. The incident affected more than 50 individuals, including local residents, commuters, fire and emergency service personnel, railway police, and ambulance staff. Symptomatic individuals were initially managed at a nearby railway hospital and later referred to a tertiary care hospital for further treatment. In addition to health effects, the surrounding environment, including household surfaces and utensils, was reportedly contaminated.

In this context, the present study was undertaken to assess the health effects of chlorine gas exposure among the affected residents of Yadavagiri, Mysuru, and to document its impact on both human health and the immediate environment.

MATERIALS & METHODS

Study design and setting: A community-based cross-sectional study was conducted among residents of Railway Loco Colony, opposite Vani Vilas Water Works (VVWW), KRS Road, Yadavagiri, Mysuru, who were exposed to an accidental chlorine gas leak.

Study participants and sampling: The study included 29 individuals affected by the chlorine gas exposure. Participants were recruited using a snowball sampling technique due to the absence of a defined sampling frame.

Data collection: Written informed consent was obtained from all participants. Data was collected through face-to-face interview using a pre-tested semi-structured questionnaire, which included information on socio-demographic characteristics, details of exposure, clinical symptoms, and perceived effects on both internal (health-related) and external (environmental) conditions.

In addition, clinical details of the affected individuals, including presenting symptoms, treatment administered, and relevant medical findings, were obtained from hospital records of patients admitted to a tertiary care centre, after securing necessary administrative permissions.

Statistical Analysis

Data was compiled and entered into Microsoft Excel and analysed using descriptive statistical methods. Results were expressed as frequencies, percentages, and proportions and presented using appropriate

graphical representations such as bar charts and pie charts.

RESULT

Out of the 29 victims, the majority of them, 12 (41.37%) belonged to 11 to 20 years age group. 24 (82.75%) were males and 5 (17.24%) were females. Table 1 and Figure 1, 2 show the age and gender wise distribution of the victims.

Table 1: Age and gender wise distribution of the victims

Characteristics	Frequency (n)	Percentage (%)
Age (years)		
1 -10	1	3.4
11-20	12	41.37
21-30	3	10.34
31-40	5	17.24
41-50	4	13.79
>50	4	13.79
Gender		
Male	24	82.75
Female	5	17.24

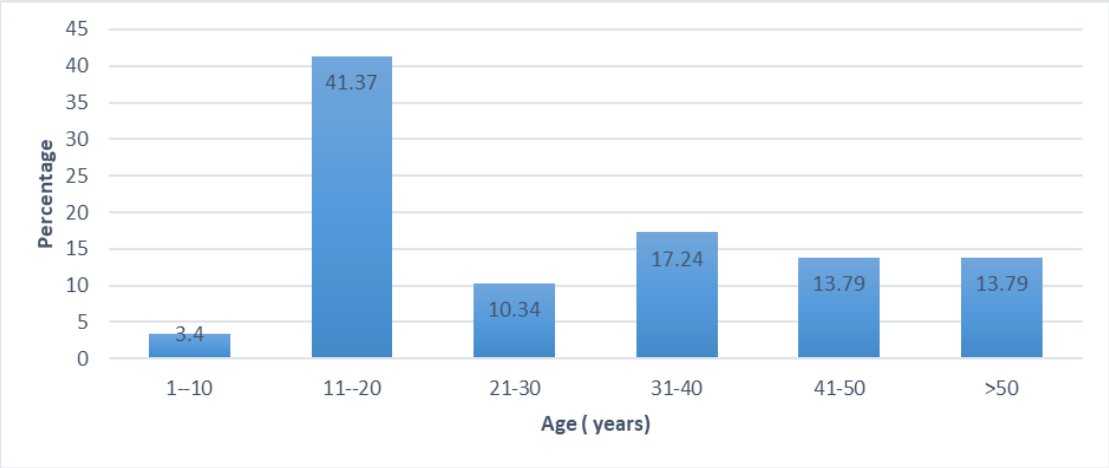

Figure 1: Age wise distribution of the victims

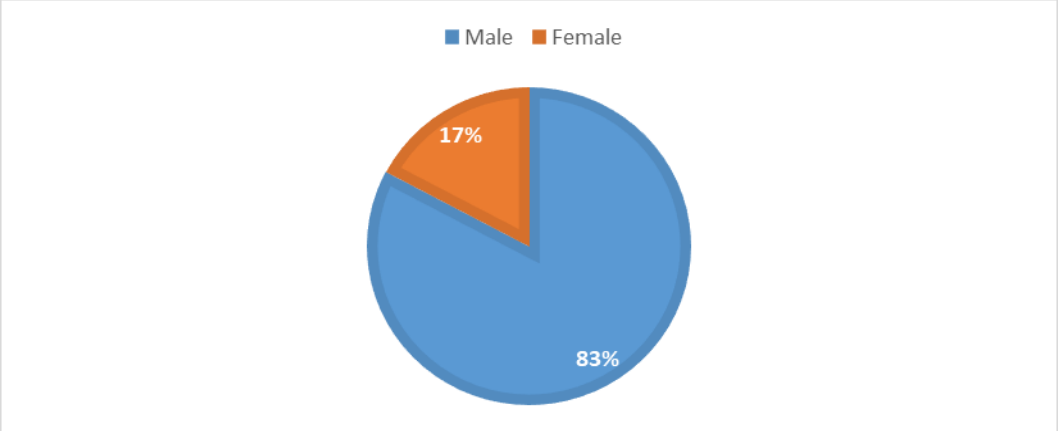

Figure 2: Gender wise distribution of the victims

Following the chlorine gas exposure 21 (72.41%) had cough, 16 (55.17%) suffered from breathlessness. Other symptoms include throat irritation, blurring of vision, giddiness and vomiting (Table 2, Figure 3). 1 (3.4%) of them had a history of diabetes, hypertension and chronic obstructive pulmonary disease each.

Table 2: Symptoms following exposure of chlorine gas

Clinical symptoms	Frequency (n)	Percentage (%)
Cough	21	72.41
Breathlessness	16	55.17
Throat irritation	9	31.03
Blurred vision	1	3.4
Giddiness	1	3.4
Vomiting	1	3.4

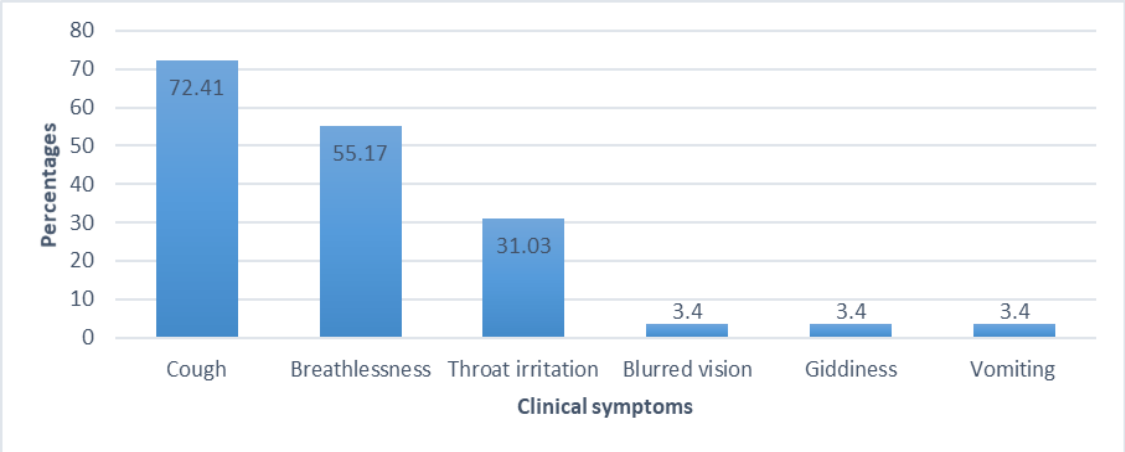

Figure 3: Symptoms following exposure of chlorine gas

According to the hospital records available, the systemic examination revealed rhonchi 1 (3.4%) and tachycardia 16 (55.17%) following the chlorine gas exposure. Investigations revealed hyperglycaemia in 8 (27.58%) of the victims, lymphocytosis in 8 (27.58%) of the victims and neutrophilia in 19 (65.51%) of the victims.

All the victims who were admitted were given oxygen supplementation, antibiotics and corticosteroids. They were kept under observation for 24-48 hours and later discharged.

Effect of Chlorine Gas on the Internal and External Environment

Field observations revealed that, within an approximate radius of 100 meters from the site of the leak, a persistent chlorine-like odour was noted at the time of data collection. Environmental impact was evident, with shedding of leaves and visible drying and wilting of vegetation, including several plants that appeared dead.

Material damage was also observed. Metallic objects, such as vehicle keys and exposed parts of vehicles, exhibited brownish discoloration suggestive of oxidative changes. Household utensils in residences located closest to the exposure site showed similar oxidative discoloration, rendering them unsuitable for use; these were reportedly segregated and stored separately by residents.

Animal exposure was also reported. Pet animals in the affected area exhibited symptoms such as vomiting and reduced responsiveness, with some described as semi-conscious for approximately 5–6 hours following exposure.

Overall, these findings indicate both environmental and biological effects of acute chlorine gas exposure in the immediate vicinity of the leak.

DISCUSSION

Chlorine is one of the most commonly encountered toxic inhalants and is known to cause significant adverse health effects following acute exposure. The extent and severity of injury depend on multiple factors, including the concentration of the gas, duration of exposure, water content of the exposed tissues, minute ventilation, and individual susceptibility. Due to its high reactivity and intermediate water solubility,

chlorine primarily affects the respiratory tract, although multisystem involvement may occur.

In the present study, cough (72.41%) and breathlessness (55.17%) were the most common symptoms reported following exposure, consistent with the known irritant effects of chlorine on the respiratory epithelium. Other symptoms such as throat irritation, blurring of vision, giddiness, and vomiting indicate involvement of the upper respiratory, ocular, and gastrointestinal systems. On examination, tachycardia (55.17%) was a prominent finding, while rhonchi were observed in a smaller proportion (3.4%). All admitted patients received oxygen supplementation, antibiotics, and corticosteroids, reflecting standard supportive management practices.

These findings are comparable with those reported in previous studies. In a study by Fleta J et al. (9), irritative cough (90.7%) was the most common symptom among children exposed to chlorine gas, followed by nasopharyngeal pruritus (65.5%). Lower respiratory tract symptoms such as chest pain, tachypnoea, and dyspnoea were also observed, though at lower frequencies. Similarly, Sever M et al. (10) reported cough (64.1%) and dyspnoea (30.8%) as the predominant symptoms, with tachypnoea being the most common clinical sign. The demographic distribution in their study, with a predominance of males (82.1%), is also consistent with the present findings.

Van Sickle D et al. (11) documented that all hospitalized patients had at least one pulmonary complaint, with additional involvement of cardiac, ocular, gastrointestinal, and otorhinolaryngeal systems. Clinical findings such as wheeze, tachypnoea, and tachycardia were also reported, similar to the present study. In the prospective observational study by Mohan A et al. (12), nearly all patients presented with dyspnoea and chest discomfort, and a high proportion had cough and ocular symptoms, further supporting the predominance of respiratory and irritative manifestations following chlorine exposure.

Case reports and smaller studies also highlight the potential for severe complications. Babu RV et al. (13) described a case progressing to acute respiratory distress syndrome (ARDS) requiring intensive care management. Similarly, Parimon T et al. (14) reported delayed onset of worsening respiratory symptoms and radiological abnormalities, emphasizing the need for close monitoring even in initially stable patients. Longitudinal studies, such as that by Bonetto G et al. (15), demonstrate that acute exposure can lead to significant pulmonary involvement in children, with some requiring intensive care support.

The management provided in the present study—primarily oxygen therapy, corticosteroids, and supportive care—is consistent with standard treatment protocols reported in the literature. While most patients recover with appropriate and timely intervention, severe exposures may necessitate intensive care, ventilatory support, and prolonged follow-up due to potential long-term respiratory sequelae.

From a public health perspective, this incident underscores the importance of preventive strategies, including proper maintenance of industrial equipment, regular safety audits, and training of personnel handling hazardous chemicals. Rapid emergency response systems and community awareness regarding immediate actions during chemical exposure are critical in reducing morbidity. Additionally, preparedness of healthcare facilities to manage chemical inhalation injuries plays a vital role in improving outcomes.

CONCLUSION

Acute exposure to chlorine gas, though uncommon in residential settings, can result in a spectrum of health effects ranging from mild upper respiratory irritation to significant respiratory morbidity. The findings of the present study highlight the predominance of respiratory symptoms following exposure and the need for prompt

medical evaluation and supportive management.

This incident underscores the importance of preventive measures, including proper installation, maintenance, and monitoring of chlorine-containing systems in community settings. Strengthening safety protocols, regular training of personnel handling hazardous substances, and ensuring rapid containment of leaks are critical to minimizing risk. Additionally, community awareness regarding emergency response and early healthcare seeking behaviour is essential to reduce morbidity associated with such exposures.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Gülolu C, Kara IH, Erten PG. Acute accidental exposure to chlorine gas in the southeast of Turkey: A study of 106 cases. Environ Res. 2002;88(2):89–93. doi: 10.1006/enrs.2001.4324.
2. Hedges JR, Morrissey WL. Acute chlorine gas exposure. J Am Coll Emerg Physicians. 1979;8(2):59–63. doi: 10.1016/s0361-1124(79)80038-6.
3. Kim JA, Yoon SY, Cho SY, Yu JH, Kim HS, Lim GI, Kim JS. Acute health effects of accidental chlorine gas exposure. Ann Occup Environ Med. 2014 Oct 1; 26:29. doi: 10.1186/s40557-014-0029-9.
4. Winder C. The Toxicology of Chlorine. Environ Res. 2001 Feb 1;85(2):105–14. doi: 10.1006/enrs.2000.4110.
5. Donnelly SC, FitzGerald MX. Reactive airways dysfunction syndrome (RADS) due to chlorine gas exposure. Ir J Med Sci. 1990 Sep-Dec;159(9-12):275-6; discussion 276-7. doi: 10.1007/BF02993611.
6. Agabiti N, Ancona C, Forastiere F, Di Napoli A, Lo Presti E, Corbo GM, et al. Short term respiratory effects of acute exposure to chlorine due to a swimming pool accident. Occup Environ Med. 2001;58(6):399–404. doi: 10.1136/oem.58.6.399.
7. The Chlorine Gas Leak at Jamshedpur | Manohar Parrikar Institute for Defence Studies and Analyses [Internet]. [cited 2025 March 10]. Available from: https://idsa.in/publisher/comments/the-chlorine-gas-leak-at-jamshedpur
8. White CW, Martin JG. Chlorine gas inhalation: Human clinical evidence of toxicity and experience in animal models. Proc Am Thorac Soc. 2010;7(4):257–63. doi: 10.1513/pats.201001-008SM.
9. Fleta J, Calvo C, Zuñiga J, Castellano M, Bueno M. Intoxication of 76 children by chlorine gas. Hum Toxicol. 1986 Mar;5(2):99-100. doi: 10.1177/096032718600500205.
10. Sever M, Mordeniz C, Sever F, Dokur M. Accidental chlorine gas intoxication: evaluation of 39 patients. J Clin Med Res. 2009 Dec;1(5):274-9. doi: 10.4021/jocmr2009.12.1283.
11. Van Sickle D, Wenck MA, Belflower A, Drociuk D, Ferdinands J, Holguin F, et al. Acute health effects after exposure to chlorine gas released after a train derailment. Am J Emerg Med. 2009 Jan;27(1):1–7. doi: 10.1016/j.ajem.2007.12.006.
12. Mohan A, Kumar SN, Rao MH, Bollineni S, Manohar IC. Acute accidental exposure to chlorine gas: clinical presentation, pulmonary functions and outcomes. Indian J Chest Dis Allied Sci. 2010 Jul-Sep;52(3):149-52.
13. Babu RV, Cardenas V, Sharma G. Acute respiratory distress syndrome from chlorine inhalation during a swimming pool accident: a case report and review of the literature. J Intensive Care Med. 2008 Jul-Aug;23(4):275-80. doi: 10.1177/0885066608318471.
14. Parimon T, Kanne JP, Pierson DJ. Acute inhalation injury with evidence of diffuse bronchiolitis following chlorine gas exposure at a swimming pool. Respir Care. 2004;49(3):291–4.
15. Bonetto G, Corradi M, Carraro S, Zanconato S, Alinovi R, Folesani G, Da Dalt L, Mutti A, Baraldi E. Longitudinal monitoring of lung injury in children after acute chlorine exposure in a swimming pool. Am J Respir Crit Care Med. 2006 Sep 1;174(5):545-9. doi: 10.1164/rccm.200509-1392OC.

How to cite this article: Shradha P S, Mudassir Azeez Khan, Rachana K Nair, Saad Mudassir Khan. Acute accidental chlorine gas exposure in Yadavagiri, Mysuru: a cross-sectional study. *Int J Health Sci Res.* 2026; 16(5):203-208. DOI: *https://doi.org/10.52403/ijhsr.20260523*

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