CASE REPORT

# Oxygen Cylinder Fire during the COVID-19 Pandemic

Bharat Paliwal[1], Nikhil Kothari[2], Anamika Purohit[3]

## Abstract

The coronavirus disease-2019 (COVID-19) pandemic has resulted in the massive utilization of oxygen cylinders during the treatment of patients. This rapid turnover has necessitated their frequent replacements. Infection control measures have encouraged the use of alcohol-based sanitizers. Over-enthusiastic or inappropriate use of these solutions may increase the risk of fire. We report an unfortunate incident of accidental fire arising out from the integration of fuel, a source of ignition, and oxygen. We also discuss the proper practices to minimize such mishaps.

**Keywords:** Coronavirus disease-2019 infection, Disinfection, Fire, Intensive care unit, Oxygen.

*Indian Journal of Critical Care Medicine* (2022): 10.5005/jp-journals-10071-24287

## Highlights

An unfortunate incident of accidental fire aroused out from the integration of fuel, a source of ignition, and oxygen. Proper practices can minimize such mishaps.

## Introduction

The COVID-19 pandemic has resulted in massive utilization of oxygen cylinders during the treatment of patients. Some patients require 100% oxygen and flows as high as 70 L/min. This rapid turnover has necessitated their frequent replacements. In addition, the pandemic's infection-control measures have encouraged the use of alcohol-based sanitizers containing at least 70% alcohol such as chlorhexidine. In the presence of combustible materials such as alcohol and oxygen, the incidence of fire is likely to increase. We report an unfortunate incident of accidental fire at our center arising out from the integration of fuel, a source of ignition, and oxygen. Coincidentally, it occurred a day after the first reported incidence of fire in a COVID intensive care unit (ICU) at Ahmedabad, India, where casualties were reported.[1] The case report gains significance in view of fire incidence in COVID ICU being reported at other places as well.[2] Written informed consent was obtained from the patient.

## Case Description

A H-type oxygen cylinder caught fire while the cylinder valve was being opened with the dedicated key. Initially, a few sparkles were seen coming from the valve end of the cylinder, which turned into flames that persisted for a minute. The fire alert was activated, but fortunately, the fire subsided on its own before help arrived. The cylinder nozzle was subsequently sprayed with a carbon dioxide fire extinguisher (Fig. 1A). The key melted with the heat (Fig. 1B). The technician suffered second-degree burns on the palm of one hand and third-degree burns on the other hand with thumb and palm involvement (Figs 2A and B). No other staff members suffered injuries.

Based on the circumstantial evidence, it appears that the fire was triggered due to a spark from friction between the valve key and residual antiseptic solution containing chlorhexidine gluconate I.P. 0.5% w/v and ethyl alcohol I.P. 70% v/v (Avagard™ 3M CHG Handrub, 3M India Limited) used for cleaning the cylinder and the hands of personnel. The fire continued until the antiseptic solution was burned off. The fire was supported by large volumes of oxygen venting from the partly opened valve. An investigation ruled out components of the medical cylinder acting as "fuels". These include nonmetallic components, such as O-rings, nylon seats, metal components, and the polytetrafluoroethylene tape that is used to make a gas-tight seal when fitting the valve to the cylinder.[3]

[1,2]Department of Anesthesiology and Critical Care, All India Institute of Medical Sciences, Jodhpur, Rajasthan, India

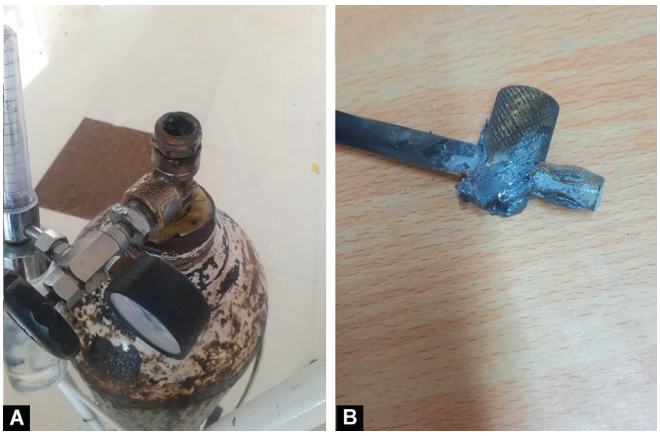
[3]Department of Obstetrics and Gynecology, District Hospital, Paota, Jodhpur, Rajasthan, India

**Corresponding Author:** Bharat Paliwal, Department of Anesthesiology and Critical Care, All India Institute of Medical Sciences, Jodhpur, Rajasthan, India, Phone: +91 9588089378, e-mail: docbpali@gmail.com

**How to cite this article:** Paliwal B, Kothari N, Purohit A. Oxygen Cylinder Fire during the COVID-19 Pandemic. Indian J Crit Care Med 2022;26(8):974–975.

**Source of support:** Nil

**Conflict of interest:** None




**Figs 1A and B:** (A) The burnt oxygen nozzle; (B) The melted oxygen key


**Figs 2A and B:** (A) Burn injury on the right thumb; (B) Burn injury on the left palm

It has been observed that alcohol-based solutions are being erroneously used to clean medical equipment and electronic devices in an overenthusiastic attempt to disinfection. These may be a potential source of fires. Personal protective equipment (PPE) can also catch fire. The risk of fires may be further compounded by impaired communication while wearing PPE causing missed early detection.[1] Use of noncombustible material such as 1% hypochlorite as an equipment disinfectant and allowing adequate contact time for alcohol-based sanitizers to dry and evaporate can minimize such incidences by limiting the "fuel" component of the fire triangle when operating in an oxygen-enriched environment.[4,5] Another safety measure may be to employ PPE of noncombustible material (e.g., rubber gloves) while handling oxygen cylinders.

The impact of ignition was minimized and no injury to the patient occurred because user instructions on the cylinder and other safety measures were exercised. These include setting up the cylinder for patient use before placing it close to the patient, placing it in an appropriately designed holder, and keeping it upright.

Fires in oxygen cylinders are very rare. Though there are very strict guidelines and standards of manufacturing, there is always an extremely small risk of ignition when handling high-pressure oxygen cylinders. Hence due care should be taken while using oxygen cylinders and disinfectants.

## Orcid

*Bharat Paliwal* https://orcid.org/0000-0001-7588-9017
*Nikhil Kothari* https://orcid.org/0000-0002-9829-905X
*Anamika Purohit* https://orcid.org/0000-0003-4835-6068

## References

1. Kelly FE, Hardy R, Henrys P. Oxygen cylinder fire–an update. Anaesthesia 2014;69(5):511–513. DOI: 10.1111/anae.12698.
2. TNN. 'Ahmedabad: Burst of fire from a table fan singed ICU in 98 seconds'. The Times of India 8 August 2020. Available from: http://timesofindia.indiatimes.com/articleshow/77425332.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst [Accessed on September 13, 2020].
3. Express News Service, Vadodara. 'Gujarat: Fire breaks out at COVID-19 ward of Vadodara hospital.' The Indian EXPRESS, 9 September 2020. Available from: https://indianexpress.com/article/cities/ahmedabad/gujarat-ssg-hospital-covid-ward-fire-live-updates-6588252/ [Accessed on September 13, 2020].
4. American Society of Anesthesiologists Task Force on Operating Room Fires. Practical advisory for the prevention and management of operating room fires. Anesthesiology 2008;108:786–801. DOI: 10.1097/01.anes.0000299343.87119.a9.
5. Apfelbaum JL, Caplan RA, Barker SJ, Cowles C, Ehrenwerth J, Nickinovich DG, et al. Practice advisory for the prevention and management of operating room fires: an updated report by the American Society of Anesthesiologists Task Force on Operating Room Fires. Anesthesiology 2013;118(2):271–290. DOI: 10.1097/ALN.0b013e31827773d2.