

Is Oxygen Humidification with Sterile Water Essential to Prevent Risk of Infection?

The recent mucormycosis infection epidemic has raised an alarm about the risk of this fungal infection due to improper oxygen humidification and poor maintenance of humidifiers. Indian Council of Medical Research issued evidence-based guidelines for its management and recommended *the use of clean, sterile water for humidifier during oxygen therapy*.^[1] Furthermore, the Director of Public Health, Department of Health, Medical and Family Welfare, Government of Telangana, India, also issued a guideline for the prevention of mucormycosis in COVID-19 patients mentioning the use of clean, sterile water for humidifiers during oxygen therapy.^[2] A minister in Karnataka blamed the use of tap water in the humidifier for oxygen therapy as the main cause for the increasing number of mucormycosis infections during the COVID-19 pandemic.^[3] However, there is a pertinent question that do we have sufficient scientific evidence to mandate the use of sterile water for oxygen humidification in resource-constraint countries like India? Nevertheless, ultimately, this additional cost has to be borne by the poor patient only.

The Centers for Disease Control and Prevention (CDC) guidelines for the prevention of nosocomial pneumonia (1997) recommended a heated bubble humidifier for the prevention of nosocomial infection. However, the most recent CDC Advisory Committee Report (1997) recommends the use of sterile water (not distilled water) in bubbling humidifiers.^[4] Contrarily, a study conducted by Cahill and Heath with the aim to compare tap water and sterile water for bacterial contamination found that culture at the end of 5 days revealed higher microorganism growth in the sterile water reservoirs.^[5] Moreover, humidifiers other than bubble-through humidifiers to generate water vapors do not aerosolize solutes or microbiome contained in water to cause microbial transmission.^[6] Wenzel *et al.* also concluded that nonsterile tap water may be a safe alternative for sterile water in convection-type humidifiers, used in continuous positive airway pressure therapy.^[7]

The WHO-UNICEF, Manual on Oxygen Therapy (2016) recommends that the humidifier should be filled with safe and clean boiled tap water or distilled water, which must be changed regularly as chances of contamination may increase over time.^[8] Koss *et al.* reported that sterile water, distilled water, and saline were potentially less contaminated up to 72 h when used for oxygen humidification, but prefilled nebulizer units should be changed every 24 h.^[9]

Data revealed that only 20% of COVID-19 patients required hospitalization and the majority required a low-flow rate of oxygen delivery.^[10] Therefore, an important question arises;

is humidification beneficial in low-flow oxygen therapy? Wen *et al.* answered in their study that oxygen humidification was not essential at low-flow rates. Furthermore, literature supported that oxygen humidification is only essential when given at high-flow rates through the nasopharyngeal route.^[11,12] However, the heat and moisture exchanger method is more beneficial for ventilator patient because it reduces the chances of infection and reduces the cost by decreasing urgency to frequent change of breathing circuit.^[13]

Finally, it is inferred that there is a scarcity of sufficient evidence to support any particular method of oxygen humidification. However, sterile water may be a preferred solution in affordable healthcare settings; however, in nonavailability and resource-constraint healthcare settings, boiled tap water with a convection-type humidifier may also be a safe substitute. Nonetheless, it is more important to regularly change the humidifying solution and clear and disinfect the humidifier reservoir, which prevents the risk of microbial colonization and infection.

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Conflicts of interest

There are no conflicts of interest.

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