



Should steam inhalation be used in the treatment and prevention of COVID-19?

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This rapid review summarizes the available evidence on the efficacy and safety of steam inhalation in the treatment and prevention of COVID-19. This may change as new evidence emerges.

KEY FINDINGS

- There is insufficient evidence the use of steam inhalation in the treatment and prevention of COVID-19. On the contrary, it may cause harm from scald burn.
- Steam inhalation, performed through a range of traditional and device-dependent techniques, has been used in the treatment of respiratory infections because of the theorized effects of heat and humidity on respiratory viruses, nasal secretions, inflammation, and airflow.
- We found no evidence on the efficacy of steam inhalation in treating and preventing COVID-19.
- It may be associated with harm, based on reports of scald burns which have increased during the pandemic.

BACKGROUND

Steam inhalation has been used both as a traditional home remedy and as adjunct in the treatment of a number of respiratory conditions, including infections such as common colds, bronchiolitis, and croup.^{[1]-[6]} The practice was based on theorized effects of both heat and humidity of warm, moist air. For common colds, one rationale was the reduced replication *in vitro* of the human rhinoviruses (the most prevalent cause of the common cold) at temperatures of 33 to 43 degrees Celsius (°C).^{[7]-[11]} On other hand, humidity may be secretolytic in bronchiolitis.^[5] In croup, it may soothe inflamed laryngeal mucosa, lessen viscosity of mucus, and ease air flow.^{[12]-[15]} In contrast to rhinoviruses, the effect of heat on the novel SARS-CoV-2 has been less established. Chin et al. reported that incubating SARS-CoV-2 in a temperature of 70°C reduced time-to-inactivation from 14 days to 5 minutes.^[16] This data may imply that higher temperatures of steam than those used for common colds would be needed for COVID-19. Nevertheless, because the efficacy of steam inhalation may also be attributable to non-temperature-related anti-viral action,^[17] studies evaluating its effects on other acute respiratory infections may provide indirect evidence of effect on COVID-19.

Steam inhalation has been distinguished from cool mist therapy, the latter being used preferentially in hospitals and high-income countries because of its relative safety and uniformity in the manner of delivery.^{[5][6]} In croup, cool mist may have similar theoretical benefits as steam, in that it may reduce mucosal edema and viscosity of secretions.^[18] While cool mist has been delivered via hospital cots or tents, steam inhalation has remained largely a home-based practice.^{[6][19]} In a survey on home remedies among 460 general practice patients in Germany, steam inhalation comprised the most frequently used symptomatic management for minor health complaints.^[19] A range of techniques has been described, some traditional (e.g. boiling a kettle, running a hot shower, staying in a sauna, or leaning over a bowl of boiling water) and some involving specialized devices (i.e. delivering steam through nozzles, anesthetic masks, or nasal cannulae).^{[6][17][20]-[24]} Devices may produce steam at 41 to 47°C while sauna temperature may reach 80 to 95°C.^{[17][20]-[22]} Certain methods may be less effective in delivering steam, and results from use may vary.^[17]

Apart from its hypothesized potential benefits, another consideration in the use of steam inhalation has been its potential for harm. One anticipated adverse effect would be scald burn.^[24] In England, half of the burn centers responding to a survey by Brewster et al. (86% response rate) reported an increase in scald cases related to steam inhalation during the COVID-19 pandemic.^[25]

In the Philippines, the practice *tu-ob* (local term for steam inhalation by leaning over a bowl of boiling water) caught the attention of medical authorities after news had circulated about its alleged therapeutic effects in COVID-19.^{[26][27]}

OBJECTIVES

The objective of this review is to determine the efficacy and safety of steam inhalation for treatment and prevention of COVID-19.

METHODS

Two investigators (TU, MM) individually conducted a comprehensive electronic search on June 26, 2020 for online journals in PubMed MEDLINE, Embase, Google Scholar, Herdin, and Medrxiv. Trial registries from clinicaltrials.gov were also searched. After screening titles and abstracts, the full text of eligible studies were independently reviewed and assessed for risk of bias. The investigators then separately graded the evidence quality. We consulted third and fourth investigators (SA, EU) to resolve disagreements, should any have arisen. We only included studies that are in the English language. Where applicable, we planned to use Review Manager Version 5.4^[28] to pool outcome data.

We planned to select articles based on the following inclusion criteria:

- **Population:** We searched for studies that reported COVID-19 patients of any age, with any comorbidities, and any level of severity.
- **Intervention:** We searched for studies on inhalation of steam or heated air or water vapor, delivered through any method, without admixed medicine or oxygen.
- **Comparator:** We searched for studies where controls received placebo, an active control, or no intervention.
- **Outcomes:**
We searched for studies that included any of the following outcomes:
 1. Improvement in signs and symptoms (e.g. increased oxygenation, decrease in respiratory distress, decrease in symptom scores, reduced symptomatic duration)
 2. Microbiologic resolution (e.g. decreased viral load/shedding, negative cultures)
 3. Improvement in airway mechanics (e.g. decreased nasal resistance, increased lung volumes)
 4. Subjective report of efficacy of therapy
 5. Adverse events (e.g. scald burn, nasal irritation, cough, etc.)
 6. Reduction in frequency of acquiring respiratory infections or cumulative days of infection
- **Study designs:** We searched for published and unpublished randomized controlled trials (RCTs), non-randomized trials, before-after studies, cohort studies, observational studies, case series and case reports.

RESULTS

We did not find any study evaluating the efficacy of steam inhalation for the treatment and prevention of COVID-19.

There were 16 studies evaluating its use for the treatment of other acute respiratory infections: 9 RCTs from the United States (US), UK, and Israel (total of 1463 subjects)^{[9][14][17][21][24][29][30][31]} and 7 before-after studies from India (total of 240 subjects)^{[23][32]-[37]}. Apart from one RCT where the acute respiratory infection was unspecified,^[24] all studies involved subjects with the common cold. Additionally, there was 1 cohort study from Austria (50 subjects) evaluating the use of steam inhalation for prevention of the common cold.^[22] Delivery of steam was traditional (i.e. leaning over bowl of boiling water, boiling a kettle, running a hot shower) in one RCT^[24] and all before-after studies, device-dependent in all other RCTs, and via sauna visits in the cohort study. Collectively, the body of evidence was of low quality, based on the potential risk of bias, indirectness, and inconsistency among the trials. Steam inhalation was not found to be beneficial in terms of resolution of symptoms, reduction in nasal viral shedding, and reduction in frequency of infections while the trials showed conflicting results in terms of improvement in symptom scores and nasal resistance among patients with acute respiratory infections. However, steam inhalation had higher subjective efficacy than placebo, meaning more treatment-group subjects than controls perceived the intervention they received as effective. One of the RCTs reported 4 scald burn cases (2%) from steam inhalation. Furthermore, we found a report from a hospital in the UK revealing an increase in cases of scald burn related to steam inhalation during the COVID-19 pandemic.^[25] Within the first month of the pandemic, the hospital has admitted 6 pediatric cases of scald burns from steam inhalation, as opposed to their yearly average of only 2 cases.

Ongoing studies

Based on our search of clinical trial registries, there are no ongoing trials on the use of steam inhalation for treatment or prevention of COVID-19.

Recommendations from Other Guidelines

We did not find any recommendations on the use of steam inhalation from the World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC). The Department of Health (DOH) and 13 medical societies in the Philippines have recommended against its use, citing the lack of evidence on efficacy and its potential risks.^{[26][27]}

CONCLUSION

There is insufficient evidence to support the use of steam inhalation for the treatment and prevention of COVID-19. However, its use may be associated with harm, based on reports of scald burns which have increased during the COVID-19 pandemic. RCTs evaluating its efficacy and safety in treating and preventing COVID-19 are warranted.

Declaration of Conflict of Interest

No conflict of interest

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