REVIEW

Journal of Ethnomedicine and Medical Wellness (*JEMEDWELL)* 2026, Volume 2, Number 2: 23-28

Olfactory nerve safe care aromatherapy: a potential management of olfactory dysfunction in Covid-19 patients

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Received: 2026-04-14
Accepted: 2026-06-04
Published: 2026-07-05

ABSTRACT

Olfactory dysfunction refers to a reduction or complete loss of the sense of smell and represents a clinically significant condition that substantially diminishes a patient's quality of life. In December 2019, a novel coronavirus (2019-nCoV) emerged in Wuhan, China, and rapidly disseminated globally. On February 12, 2020, the World Health Organization (WHO) designated the resultant illness Coronavirus Disease 2019 (COVID-19). A considerably high proportion of patients infected with SARS-CoV-2 report anosmia as a prominent symptom; however, the precise cellular and molecular mechanisms underlying this manifestation remain incompletely understood. Current therapeutic approaches for COVID-19-associated anosmia include nasal irrigation, intranasal or systemic corticosteroids, and intranasal sodium citrate. Emerging treatment modalities under active investigation include tissue engineering and stem cell therapy; nonetheless, none of the existing or investigational treatments has demonstrated sufficient efficacy in resolving anosmia. In light of these therapeutic limitations, the Olfactory Nerve Safe Care Aromatherapy (ONSCA) inhaler is proposed as a promising adjunct for managing olfactory dysfunction. This product is designed to be both effective and convenient, enabling patients with anosmia to administer therapy at any time and in any setting. The formulation incorporates four primary aromatic compounds: fruity, flowery, spicy, and resinous, selected to optimally stimulate olfactory recovery. Collectively, the available evidence suggests that ONSCA holds considerable promise as an effective and accessible solution for COVID-19-associated olfactory dysfunction.

Keywords: anosmia, aromatherapy, COVID-19, management.
Cite This Article: Donita, S.P., Yuliantari, N.L., Diputra, K.B.D. 2026. Olfactory nerve safe care aromatherapy: a potential management of olfactory dysfunction in Covid-19 patients. *Journal of Ethnomedicine and Medical Wellness* 2(2): 23-28

INTRODUCTION

In December 2019, pneumonia caused by a 2019 novel coronavirus (2019-nCoV) emerged in Wuhan, China, and rapidly spread throughout the country and across international borders. On February 12, 2020, the WHO officially named this illness Coronavirus Disease 2019 (COVID-19). Clinical evidence has demonstrated human-to-human transmission, and the resulting pandemic has imposed a profound burden on healthcare systems worldwide.[1]

Among the most frequently reported symptoms of COVID-19 are fever, cough, and anosmia (loss of smell), with approximately one-third of patients also experiencing dyspnea.[2] Reports of olfactory dysfunction have emerged across multiple countries, coinciding with a marked increase in internet searches for "loss of sense of smell." The United States Centers for Disease Control and Prevention (CDC) has recognized anosmia and ageusia as hallmark symptoms of COVID-19.[1,3] Olfactory disturbances may range from hyposmia (partial reduction in smell perception) to anosmia (complete loss). Ageusia, defined as the loss of taste perception, frequently co-occurs with anosmia, as much of the sense of taste is mediated through olfaction.[4]

Anosmia has been identified as one of the most distinctive symptoms in COVID-19 patients.[5] In a multicenter study conducted across 12 European hospitals, olfactory and gustatory dysfunction was reported in 85.6–88% of patients with mild-to-moderate disease.[6] A London-based report documented anosmia and ageusia in 55% of patients, with nine experiencing only ageusia and three experiencing only anosmia; the median onset of anosmia was 4 days after symptom onset, with a median duration of 8 days.[7]

Beyond its sensory impact, anosmia can lead to headaches, and in some cases, neural or cerebral damage, underscoring the urgent need for effective treatment strategies.[8] Current literature indicates that no definitively effective treatment for anosmia has been established to date. Existing therapeutic options include nasal irrigation, intranasal or oral corticosteroids, and intranasal sodium citrate, while emerging approaches such as tissue engineering and stem cell therapy remain under development.

Given the limitations of current treatments, olfactory training has emerged as a practical and accessible intervention for COVID-19-associated anosmia.[9] This approach involves repeated exposure to specific odorants to promote neural recovery. Aromatherapy products available in pharmacies and retail settings are commonly used for this purpose, with patients instructed to inhale various scents for approximately 20 seconds per session, repeated consistently each day.

To optimize olfactory recovery, at least four distinct aromatic categories are recommended: fruity, flowery, spice, and resinous.[10] However, these four aroma types are typically sold separately, posing a logistical and financial burden for patients seeking to complete a comprehensive olfactory training regimen. To address this gap, a single-unit inhaler device incorporating all four primary aromatic compounds, the Olfactory Nerve Safe Care Aromatherapy (ONSCA), has been proposed as an integrated solution. This review aims to evaluate the potential of ONSCA as an effective modality for the management of olfactory dysfunction in COVID-19 patients.

METHODS

This article employs a literature review methodology. The authors conducted systematic database searches using the keywords SARS-CoV-2, COVID-19, anosmia, and ONSCA, combined with the Boolean operator "AND." Searches were performed across multiple electronic databases, including Google Scholar, PubMed, and other peer-reviewed journal repositories. Peer-reviewed international journal articles were selected as primary references. Retrieved data were systematically organized and synthesized in accordance with the scope of the research questions addressed in this review.

RESULTS

Olfactory Dysfunction

The mechanism by which SARS-CoV-2 infection induces olfactory dysfunction has been explored through experimental models. Studies employing coronavirus inoculation in animal models have demonstrated that the virus can damage the olfactory neuroepithelium via apoptosis, leading to a reduction in sensory neurons and disruption of the olfactory epithelium.[11] Additional research has identified infection of sustentacular and perivascular cells within the olfactory epithelium as a contributing mechanism underlying anosmia and hyposmia.[12]

Clinical experiments in healthy volunteers have shown that intranasal coronavirus inoculation can impair the sense of smell. Angiotensin-converting enzyme 2 (ACE2) is expressed on the surface of the nasal mucosa, and olfactory changes in COVID-19 patients are generally not accompanied by rhinitis symptoms, suggesting that damage to the olfactory pathway, rather than nasal obstruction, is the primary mechanism. The virus is hypothesized to cause structural damage to the olfactory bulb.[11]

Anosmia in COVID-19 patients appears to result not primarily from neuronal cell destruction, but rather from viral targeting of non-neuronal cells expressing ACE2 receptors, including sustentacular cells of the olfactory epithelium, microvillar cells, Bowman's gland cells, horizontal basal cells, and olfactory bulb pericytes. Infection of these supporting and perivascular cells may functionally impair olfactory neurons.[13] Furthermore, damage to olfactory receptors in the nasal and oral mucosa[12] may result from inflammatory processes that destroy olfactory neurons.[14]

Over time, excessive cytokine production can induce neuroepithelial histological changes and olfactory neuron death. Basal stem cells within the olfactory epithelium are capable of regenerating new olfactory neurons once cytokine-driven inflammation subsides, thereby facilitating the restoration of olfactory function. Sensorineural anosmia arises when neuroepithelial damage is caused by toxic inflammatory mediators such as TNF-α and IL-1β, as well as infiltrating inflammatory cells.[12]

Relationship Between Olfactory Dysfunction and COVID-19

Olfactory dysfunction broadly encompasses three mechanistic categories: conductive, sensorineural, and neural disorders. Conductive dysfunction results from impaired transport of odorants to the olfactory neuroepithelium or disrupted binding of odorants to G-protein (Golf) receptors. Sensorineural dysfunction typically arises from direct damage to the olfactory neuroepithelium, such as that caused by air pollution-related respiratory infections. Neural disorders, in contrast, involve damage to the olfactory bulb, as may occur with intracranial tumors.[7]

SARS-CoV-2 exploits the spike protein S1 subunit to attach virions to host cell membranes, subsequently interacting with ACE2 receptors. Research has demonstrated that SARS-CoV-2 can trigger neurological manifestations through both direct and indirect pathways. Due to the unique anatomical relationship between the olfactory system, olfactory bulb, and olfactory nerve, the virus may gain access to the central nervous system via the cribriform plate.[1]

An analysis of viral loads in nasal and throat swabs from 17 symptomatic patients found that viral loads in the nasal cavity were consistently higher than in the oropharynx, consistent with the hypothesis that the nasal cavity represents the initial site of viral entry.[15]

The precise mechanisms underlying COVID-19-associated olfactory dysfunction continue to be investigated. High-level expression of ACE2 receptors in nasal epithelial cells is thought to facilitate viral entry, followed by inflammatory disruption of olfactory receptor neuron function and subsequent transient or persistent anosmia.[16]

Management of Olfactory Dysfunction in COVID-19 Patients

Olfactory training is currently the most widely recommended management strategy for COVID-19-associated olfactory dysfunction, applied in accordance with protocols established for post-viral anosmia from other etiologies.[9] This training typically involves exposure to aromatic stimuli; however, no specific pharmacological agent has been demonstrated to definitively cure olfactory dysfunction.

Various therapeutic strategies have been investigated across the literature, including pharmacological interventions such as oral and topical corticosteroids, gene therapy, caroverine, alpha-lipoic acid, and vitamin A for the treatment of olfactory dysfunction.[9] Despite these efforts, robust evidence supporting the routine use of any single pharmacological agent for persistent post-infectious anosmia remains lacking. Olfactory training using aromatic stimuli remains the most recommended approach, as these stimuli can activate brain regions connected to the olfactory nerve. However, olfactory training is inherently time-intensive, and its full therapeutic benefit may take a considerable period to manifest.[9]

Intranasal or Oral Corticosteroid Therapy

Since the onset of the COVID-19 pandemic, otolaryngologists have reported an unprecedented surge in sudden-onset anosmia, with or without other associated symptoms. Despite growing research attention, the precise mechanism of olfactory dysfunction in COVID-19 remains undetermined, and no treatment has yet proven fully satisfactory.

In a randomized clinical trial involving 276 patients with COVID-19-associated anosmia, participants were randomly allocated to two equal groups of 138. Baseline characteristics revealed that the majority of participants were young females, consistent with prior reports suggesting that olfactory dysfunction is more prevalent among younger individuals and women.[17,18,19] This finding may reflect the stronger local immunological responses observed in younger patients, resulting in more pronounced local inflammatory reactions that manifest as olfactory dysfunction.[18] The higher prevalence of anosmia in women may be related to greater female sensitivity to olfactory changes compared to men. A notable feature of the study population was the high co-occurrence of anosmia and ageusia, observed in 84.8% of patients.[20,21] Consistent with prior literature,[18,22] a low proportion of participants in this study were smokers.

Generally, most patients with COVID-19-related olfactory dysfunction recover within 1–4 weeks, with an average recovery time of 1–2 weeks.[17,23,24] In this trial, 83% of participants recovered from anosmia within the 30-day follow-up period, with a mean recovery time of 13 days from symptom onset. In a subset of cases, however, anosmia persisted beyond the follow-up window. The rapid recovery observed in the majority of patients suggests that the primary mechanism of olfactory impairment may involve transient disruption of olfactory epithelial cells, while neuronal injury in select cases may underlie prolonged anosmia. These findings parallel previously described mechanisms for post-viral anosmia from other viral etiologies. Further research with specific attention to anosmia duration prior to corticosteroid initiation is warranted.

Nasal Irrigation Therapy

Nasal irrigation involves flushing the nasal cavity with physiological saline solution. This procedure is safe, simple, and can be performed by any individual at any time without risk of disease or complications. The primary goal of nasal irrigation is to cleanse and preserve the health of the nasal cilia, thereby maintaining proper mucociliary function.

Isotonic saline solutions such as 0.9% NaCl are used in nasal irrigation to support mucociliary clearance.[25] Reported physiological effects of nasal irrigation include direct mechanical cleansing, removal of inflammatory mediators, and enhancement of mucociliary function.[26]

Intranasal corticosteroid sprays may also improve olfactory function by attenuating inflammation within the olfactory cleft, potentially driven by eosinophil-mediated mechanisms.[26] Continuation of intranasal steroid therapy is particularly recommended for patients who were already receiving such treatment prior to the pandemic, such as those with allergic rhinitis.[16]

Zinc is an essential trace element involved in enzymatic activity and cellular proliferation. The maintenance of olfactory and gustatory sensory cells depends on ongoing cellular regeneration, and zinc supplementation has long been utilized in the treatment of smell and taste disorders. Olfactory function recovery has been shown to occur more rapidly in patients with post-viral olfactory dysfunction who maintain normal serum zinc levels. Patients with zinc deficiency who receive supplementation demonstrate faster recovery compared to those who do not.[27]

Stem Cell Therapy

The pathophysiology of COVID-19-associated anosmia is not yet fully elucidated. One prevailing hypothesis posits that SARS-CoV-2 directly damages the olfactory pathway, thereby inducing anosmia.[28]

Brann et al. (2020) proposed that olfactory loss in COVID-19 patients results from infection of supporting cells and vascular pericytes within the olfactory epithelium and olfactory bulb, which sequentially impairs olfactory neuron function. Further involvement of stem cells expressing low levels of ACE2 receptors may underlie persistent olfactory dysfunction.[29] Nevertheless, data from prior COVID-19 case series have indicated a substantial rate of olfactory function recovery within 1–2 weeks of dysfunction onset. An alternative hypothesis attributes anosmia to neuronal death, particularly mediated by IL-6 produced by neurons in response to stimulation by the SARS-CoV-2 spike protein.[31]

Prior studies have suggested that olfactory loss (anosmia) may serve as a positive prognostic indicator in patients with mild COVID-19 symptoms, with data indicating significantly lower rates of hospitalization, intensive care unit (ICU) admission, and acute respiratory distress syndrome (ARDS) compared to patients without olfactory dysfunction.[32] These findings have been linked to relatively higher lymphocyte and albumin levels in anosmic patients, suggesting a milder systemic inflammatory response. Accordingly, patients presenting with olfactory dysfunction may demonstrate a more favorable clinical trajectory than those without this symptom.

Olfactory Nerve Safe Care Aromatherapy

The Olfactory Nerve Safe Care Aromatherapy (ONSCA) represents an innovative aromatherapy product formulated as an inhaler device containing four distinct aromatic compounds (**Figure 1**). This product was developed with the goal of facilitating olfactory recovery, particularly among COVID-19 patients experiencing anosmia. The four incorporated aroma categories are: (1) Fruity, (2) Flowery, (3) Spice, and (4) Resinous.

Previous research has established that these four aroma types collectively constitute the primary olfactory archetypes in human scent perception, forming the foundation for all other aromatic experiences. As such, ONSCA, by integrating all four primary odorants into a single delivery system, represents a substantial advancement over conventional single-scent preparations. The product enables patients to access a complete olfactory training regimen without the need to source each aroma independently, thereby reducing both logistical burden and cost. In addition, the device includes standardized instructions for proper olfactory training technique.

The olfactory training protocol employed in ONSCA follows established aromatherapy principles. Users are instructed to inhale each of the four scents sequentially for at least two sessions per day, with each session lasting approximately 20 seconds. The regimen is intended to continue for a minimum of three months or until full olfactory function is restored. A key design feature of the product is the variation in the sequence of inhaled aromas across sessions, which is intended to prevent habituation and sustain patient engagement throughout the therapeutic course. The portable, inhaler-based format facilitates adherence by enabling training to be performed in any setting.

Although ONSCA offers several notable advantages, one limitation relates to the processing time required to prepare and combine four distinct aromatic substances into a single product. This challenge may be compounded by the potential scarcity of raw materials and disruptions to the distribution supply chain.

The design of ONSCA adapts the functionality of a retractable pen to accommodate an aromatherapy inhaler mechanism. Despite its pen-like form, the device contains aromatic compounds intended for inhalation therapy. Its compact dimensions allow the device to be carried conveniently, enabling olfactory training to be performed anywhere. The aromatic cartridges are designed to be refillable, analogous to replacing ink in a retractable pen.

The product is planned for mass production by specialized manufacturers capable of ensuring consistency in the concentration of each aromatic ingredient and precise calibration of scent intensity, preventing any single aroma from dominating the formulation. While adverse effects associated with ONSCA are not expected to be severe given its natural ingredient composition, individuals with asthma, rhinosinusitis, or hypersensitivity to any component of the product may experience exacerbation of their underlying condition. However, the inhalation-only route of administration employed by ONSCA is considerably safer than oral aromatherapy administration.[33]

Figure 1. Application of ONSCA inhaler device

Efficacy of ONSCA Constituents in Patients with Anosmia

The selection of raw materials with high essential oil content is a key strength of the ONSCA formulation. Essential oils are volatile, complex chemical mixtures that vaporize without decomposition and carry characteristic aromas specific to their botanical origin. Proper blending is critical to maximizing the therapeutic potential of essential oils in addressing olfactory dysfunction. These oils are naturally obtained through extraction from various plant parts, including flowers, leaves, stems, fruits, roots, and resins, at concentrations that vary by plant species.[34] The low vapor pressure of essential oils facilitates rapid evaporation, and the resulting vapors are capable of influencing the human nervous system. In this context, essential oil components may stimulate cellular processes involved in olfactory nerve regeneration and the restoration of normal olfactory function. The use of four primary aromatic archetypes is central to this approach, as these odors represent the foundational categories of human olfactory perception and are essential for the accurate discrimination of both scents and flavors.[35]

1. The first aromatic category, Flowery, is represented by rose (*Rosa sp.*), whose essential oil content ranges from 60–70% and includes phenylethyl alcohol as a major constituent. The chemical profile of rose essential oil encompasses citronellol, geraniol, nerol, linalool, farnesol, stearoptene, α-pinene, β-pinene, α-terpinene, limonene, p-cymene, camphene, β-caryophyllene, neral, citronellyl acetate, geranyl acetate, neryl acetate, eugenol, methyl eugenol, rose oxide, α-damascenone, β-damascenone, benzaldehyde, benzyl alcohol, rhodinyl acetate, and phenylethyl formate. Beyond its essential oil composition, rose contains biologically active compounds such as vitamin E, nerol, therapeutic terpenoids, flavonoids with antibacterial properties, and polyphenols with cytoprotective activity against oxidative damage.[36]
2. The Fruity category utilizes lemon (*Citrus limon L.*, family *Rutaceae*), whose essential oil contains approximately 70% limonene as the principal bioactive constituent.[34]
3. The Spice category employs nutmeg (*Myristica fragrans*) due to its exceptionally high essential oil content, with whole seeds containing 25–40% and mace containing 20–30% essential oil, though concentrations

vary depending on seed size. Per 100 g of nutmeg flesh, the composition includes approximately 10 g water, 7 g protein, 33 g fat, and an essential oil fraction comprising monoterpene hydrocarbons (61–88%), including α-pinene, β-pinene, and sabinene as major components, monoterpene acids (5–15%), and aromatic ethers such as myristicin and elemicin (2–18%).

4. The fourth aromatic archetype, Resinous, is derived from pine resin (*Pinus sp.*). Pine essential oil is obtained from the turpentine fraction of the resin, which constitutes 10–17.5% of the total resin volume. The principal components of both pine resin and turpentine oil include α-pinene, Δ-3-carene, and β-pinene. Turpentine oil is produced through two primary processes: resin tapping and wood extraction. Among its commercial applications, turpentine oil serves as a raw material for perfume synthesis. Extraction of the essential oil from pine resin yields terpineol, specifically α-terpineol, one of three isomeric terpene alcohols with characteristic fragrance properties. Terpineol is also used as a component in massage oils for its relaxant effects. The abundance of pine trees in nature facilitates sustainable sourcing of this ingredient for use in ONSCA production.[37]

The high essential oil content of all four primary ingredients in ONSCA confers a substantial advantage over conventional aromatherapy products, which frequently rely on synthetic fragrance compounds. Synthetic fragrances are generally associated with a higher risk of adverse effects, including irritant reactions, compared to their naturally derived counterparts.[38]

CONFLICT OF INTEREST

All authors declared that there is no conflict of interest regarding this article.

FUNDING

This article is self-funded by authors.

ETHICS APPROVAL

Not applied.

AUTHOR'S CONTRIBUTION

All authors contributed equally in the writing process of this article.

CONCLUSION

Coronavirus Disease 2019 (COVID-19), caused by SARS-CoV-2, is associated with a high prevalence of anosmia, the cellular and molecular mechanisms of which have not yet been fully elucidated. Existing treatment modalities, including nasal irrigation, intranasal or systemic corticosteroids, and stem cell therapy, have demonstrated limited efficacy and remain in various stages of development, underscoring the urgent need for novel therapeutic approaches. This review identified ONSCA, a compact inhaler device incorporating the four primary olfactory aromatic archetypes (fruity, flowery, spice, and resinous) in a single, refillable unit, as a feasible, accessible, and effective modality for the management of COVID-19-associated olfactory dysfunction. Its portable design and standardized training protocol support patient adherence and home-based use. Future research is recommended to investigate the optimal composition, dosing regimens, duration of therapy, and long-term clinical outcomes associated with ONSCA in patients with persistent COVID-19-associated anosmia. Furthermore, it is recommended that ONSCA be formulated with precisely calibrated concentrations of the fruity, flowery, spice, and resinous aromatic compounds to ensure optimal therapeutic efficacy and patient tolerability.

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