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Inhalation therapy as a mode of home remedial treatment of COVID-19 in Bangladesh

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Abstract

COVID-19 (for coronavirus disease 2019) is the name given to the current pandemic sweeping the world and which started in Wuhan, China at the tail end of December 2019. The causative agent for the disease is SARS-CoV-2 or Severe Acute Respiratory Syndrome Coronavirus 2. As of April 2, 2022 the virus has caused a total of 490,432,789 infected cases throughout the world, which has resulted in 6,172,729 deaths worldwide. The corresponding statistics for Bangladesh are 1,951,714 and 29,122, respectively, which translates to 11,648 cases per million population. Although the world average is 62,918 cases per million population, most rural Bangladesh people suffer from an adequate access to Intensive Care Units, or even hospitals, drugs and vaccines because of a combination of illiteracy, lack of finances for proper treatment, and inadequate access to modern treatment centers. As a result, the people residing mostly outside the capital city Dhaka, have resorted to various home remedial treatments for COVID-19, some of which appear to be surprisingly effective as symptomatic treatments of the disease. The objective of the present study was to document the various forms of inhalation therapy practiced by COVID-19 patients in four districts of Bangladesh and further evaluate the pharmacological significance of this type of therapy.

Keywords: Inhalation, therapy, COVID-19, treatment, remedial

Introduction

On December 31 2019, several cases of an unknown type of pneumonia was detected in Wuhan city of Hubei Province, China [1]. On January 7 2020, this disease was attributed to a new coronavirus, SARS-CoV-2 or Severe Acute Respiratory Syndrome Coronavirus 2. COVID-19 (for coronavirus disease 2019) is the name given to the current pandemic sweeping the world and which started in Wuhan, China at the tail end of December 2019, the causative agent being SARS-CoV-2 [2].

As of April 2 2022, the virus has caused a total of 490,432,789 infected cases throughout the world, which has resulted in 6,172,729 deaths worldwide. The corresponding statistics for Bangladesh are 1,951,714 and 29,122, respectively, which translates to 11,648 cases per million population [<https://www.worldometers.info/coronavirus/>]. Only a few vaccines against SARS-CoV-2 have been approved for use as of April 2022 by the World Health Organization, a partial list of some of the vaccines being BNT162b2/COMIRNATY/Tozinameran (INN) (Pfizer-BioNTech), mRNA-1273 (Moderna), AZD1222 Vaxzevria (AstraZeneca), and COVISHIELD (Serum Institute of India) [3]. The vaccines suffer from a number of inadequacies, chiefly among them being requirement of cold storage temperatures, lack of availability to people of developing countries, and decrease in effectiveness against the emerging variants of SARS-CoV-2, like the omicron variant [4]. There is a lack of effective drugs against SARS-CoV-2. Some of the conditional recommended anti-SARS-CoV-2 therapeutics (as per World Health Organization or WHO Guidelines) like molnupiravir, casirivimab, imdevimab, or baricitinib (to mention only a few) [5] are either not available or affordable to the majority low-income population of countries like Bangladesh.

Although the world average is 62,918 COVID-19 cases per million population (versus 11,648 in Bangladesh), most rural Bangladesh people suffer from an inadequate access to Intensive Care Units, or even hospitals, drugs and vaccines because of a combination of illiteracy, lack of finances for proper treatment, and inadequate access to modern treatment centers. As a result, the rural people residing mostly outside the capital city Dhaka, have resorted to various

home remedial treatments for COVID-19, some of which appear to be surprisingly effective as symptomatic treatments of the disease. One of these type of home remedy treatment is inhalation therapy. We had been studying effect of various phytochemicals on SARS-CoV-2 *in silico* [6-11], and the different types of COVID-19 home remedies practiced in various regions of Bangladesh [12-14]. The objective of the present study was to document the various forms of inhalation therapy practiced by COVID-19 patients in four districts of Bangladesh and further evaluate the pharmacological significance of this type of therapy. What is of significance here is that COVID-19 is a new disease, which the world has seen for the first time. Nevertheless, despite its novelty, there appears to be no dearth of home remedies.

Methods

Preliminary information that a person has contracted COVID-19 was given to us by our COVID-19 network (to be noted that our informal network does not cover all COVID-19 patients throughout the country, but only patients who are known directly or indirectly by the student members of the

network) in various areas of Bangladesh. It is to be mentioned that since the advent of COVID-19, through various student bodies at our academic institution, we had been gathering data on various aspects of COVID-19, including its spread and treatment methods – both conventional and traditional (including home remedial). The present survey was conducted in January and February 2021. Prior Informed Consent was initially collected from both patient and at least one near relative. All information about COVID-19 patients were collected from patients and close relatives of the patients over cell phone. It was made clear to patients and families that apart from gender, age and the name of their village, nothing else will be divulged. Patients and caretakers/relatives were mainly questioned as to (I) whether the patient have been tested using PCR-based tests for COVID-19 positivity, and (II) type of home remedies if any that they have taken during their sickness phase till they have tested COVID-19 negative (PCR-test again) [14]. A map of Bangladesh is given in Figure 1 showing the location of the four districts (Tangail, Dhaka, Dinajpur, and Gaibandha) from which information was collected.

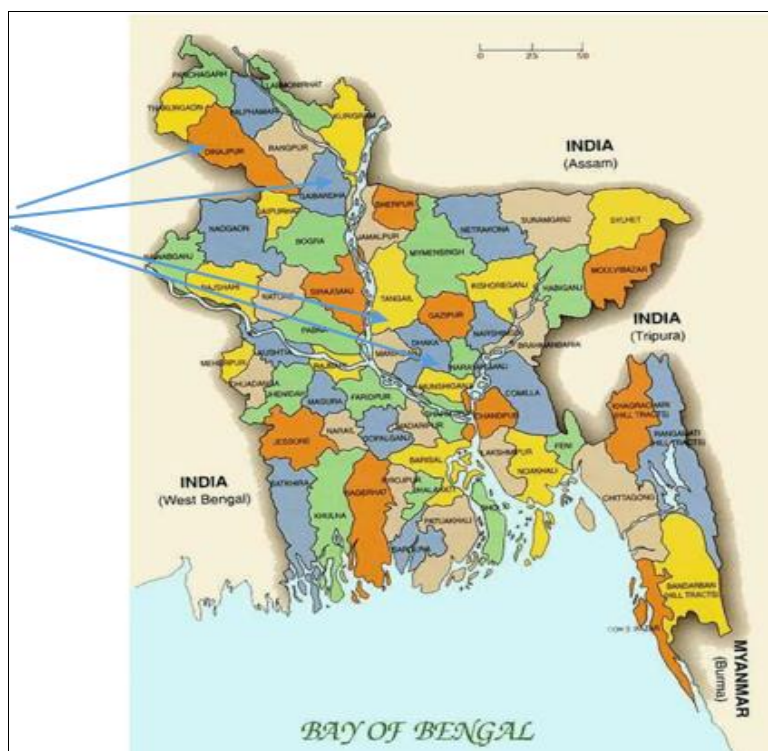


Fig 1: Map of Bangladesh showing the four surveyed districts.

Results and Discussion

An interesting feature of the home remedies against COVID-19 that we found early on during the information gathering period is that a number of patients were using inhalation for

symptomatic relief from COVID-19 induced sore throat, dry coughs, fever, and general discomfort. The results are shown in Table 1.

Table 1: Mode of inhalation therapy practiced by COVID-19 patients in different districts of Bangladesh.

Age (years)	Gender	District of residence	COVID-19 severity	Mode of inhalation therapy
27	Female	Tangail	Mild*	Steam from boiling water was inhaled several times daily.
36	Male	Dhaka	Mild	Steam from boiling water was inhaled several times daily.
23	Female	Dhaka	Mild	Steam from boiling water containing menthol (C ₁₀ H ₂₀ O) was inhaled several times daily.
42	Female	Dinajpur	Mild	Steam from boiling water containing ginger ¹ , cardamom ² , black pepper ³ , cloves ⁴ , cinnamon ⁵ , and bay leaf ⁶ was inhaled several times daily.
53	Male	Gaibandha	Mild	Steam from boiling water containing ginger ¹ , cardamom ² , black pepper ³ , cloves ⁴ , cinnamon ⁵ , and bay leaf ⁶ was inhaled several times daily.
16	Male	Tangail	Mild	Steam from boiling water containing ginger ¹ , cardamom ² , black pepper ³ , cloves ⁴ , cinnamon ⁵ , and bay leaf ⁶ was inhaled several times daily.

13	Female	Dinajpur	Mild	Steam from boiling water containing ginger ¹ , cardamom ² , black pepper ³ , cloves ⁴ , cinnamon ⁵ , and bay leaf ⁶ was inhaled several times daily.
70	Male	Gaibandha	Mild	Steam from boiling water was inhaled several times daily.

All patients reported in this Table tested COVID-19 positive (PCR testing in an established COVID-19 testing laboratory). Inhalation therapy was done by the patients themselves without consulting a physician. Advice, if any, was taken from friends or relatives. The survey was conducted during January and February 2021, when beta variant of SARS-CoV-2 (B.1.351) cases were rising in Bangladesh [<https://gh.bmj.com/content/6/5/e006012>]. However, the exact variant of SARS-CoV-2 causing COVID-19 in the patients mentioned in Table 1 was not determined.

Mild Illness: Individuals who have any of the various signs and symptoms of COVID-19 (e.g., fever, cough, sore throat, malaise, headache, muscle pain, nausea, vomiting, diarrhea, loss of taste and smell) but who do not have shortness of breath, dyspnea, or abnormal chest imaging.

[<https://www.covid19treatmentguidelines.nih.gov/overview/clinical-spectrum/>]

*Mild illness was as per physician's diagnosis.

¹Ginger. Rhizome of *Zingiber officinale* Roscoe (Zingiberaceae).

²Cardamom. Dry fruits (containing seeds) of *Ellettaria cardamomum* (L.) Maton (Zingiberaceae).

³Black pepper. Small dried berries of *Piper nigrum* L. (Piperaceae).

⁴Clove. Dried floral buds of *Syzygium aromaticum* (L.) Merr. & L.M. Perry (Myrtaceae).

⁵Cinnamon. Dry bark of *Cinnamomum verum* J. Presl (Lauraceae).

⁶Bay leaf. Dried leaf of *Cinnamomum tamala* (Buch.-Ham.) T. Nees & Eberm. (Lauraceae).

Data was obtained from both male and female patients. The age of the patients ranged from 13 to 70 years. The simplest mode of inhalation therapy was boiling of water followed by inhalation of the steam. More complicated forms of inhalation therapy was inhalation of steam from boiling water containing various combinations of ginger, cardamom, black pepper, cloves, cinnamon, and bay leaf. One patient inhaled steam from boiling water containing in addition menthol. Inhalation as a form of home remedial treatment for COVID-19, according to the patients, provided relief from a number of COVID-19 symptoms, the most frequent symptom being sore throat and coughs, and according to the patients contributed to their getting well. Certainly, as per our conversations with patients and relatives, they expressed a firm conviction that practice of inhalation therapy was the major reason for their getting well.

Inhaling steam with herbal ingredients (such as eucalyptus oil, garlic, ginger, tea tree and other herbs) would inactivate the SARS-CoV-2 virus, is an idea that has its supporters also outside Bangladesh. However, the World Health Organization (WHO) has dismissed these claims as potentially dangerous [15]. However, the concerns of WHO has a lot to do with getting scalded with boiling water and inhaling steam containing volatiles from potentially toxic herbs. It may be pointed out that ginger, cardamom, black pepper, cloves, cinnamon, and bay leaf, which are used in inhalation therapy in Bangladesh are widely used culinary spices with ginger and cloves being considered as specially effective during respiratory disorders. It is a very common home remedy in Bangladesh to put a clove in the mouth or to drink ginger tea (made from boiling black tea and slices of ginger rhizome in

water) during sore throat, coughs and common cold. Inhalation of menthol has also been reported to suppress coughs in an evoked cough model [16]; menthol can also stimulate receptors for cold in the upper airway and reduce respiratory discomfort associated with loaded breathing [17]. Steam inhalation has been a traditional remedy for respiratory tract infections like coughs and cold [18]; as such, it comes as no surprise that inhalation with just steam only was one of the choices of people in homesteads of Bangladesh as a therapy for COVID-19 induced coughs and breathing problems. Since home remedies in Bangladesh is influenced by its long association with Ayurveda, it is to be further noted that Ayurveda prescribes steam inhalation for uncomplicated chronic sinusitis [19].

One study has concluded that steam inhalation with various combinations of herbal products may be effective in controlling SARS-CoV-2 [20]. It was of interest to evaluate at least one spice component used in steam inhalation by the COVID-19 patients, and for that we chose ginger. Hydrodistillation of fresh and dried ginger rhizomes of Nigerian origin reportedly yielded 54 volatile components, chief among them being mono- and sesqui-terpenoids like geranial, neral, 1,8-cineole, zingiberene, β -bisabolene and β -sesquiphellandrene [21]. Other reported terpene ingredients of ginger rhizomes include farnesene, limonene, cineole, linalool, borneol, and curcumene. Phenolic compounds in ginger include gingerols, paradols, shogaols, and zingerone. As reviewed by Jafarzadeh *et al.* (2021), a number of these compounds have anti-inflammatory, antioxidative, and antiviral effects including possible therapeutic effects against COVID-19 [22]. Incidentally, volatile components of a Traditional Chinese Medicine, Dayuan-Yin, contains ginger as one of its ingredients and has been found to be beneficial against COVID-19 [23].

Home remedies are a common feature in practically every country of the world. A household survey in Northern India found that 104 plants were used in home remedial treatments of diverse diseases [24]. Cinnamon, ginger, clove, honey, cardamom, lemon, garlic, onion, turmeric, and licorice are common home remedies in many countries including India and Bangladesh for coughs, cough being a common symptom of COVID-19 [25]. Steam inhalation, hot lemon drink, honey, chamomile tea, and chicken soup were among the home remedies used by respondents (patients of general practitioners) in Germany according to a published report; on average, each respondent of a total of 480 used 22 different home remedies [26]. A recent review mentions that orange, onion, garlic, mint, and black cumin are among the most used adjuvant therapies for COVID-19 [27].

To conclude, in the absence of affordable and easily available therapeutics for COVID-19, home remedies can prove to be a suitable means for at least symptomatic treatment of this disease.

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