



SHORT REPORT

The Potential Use of Mandi Wap Herba in Coronavirus Diseases (COVID-19)

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Disclosure

The authors of this review have no competing interest in this subject.

Disclaimer

This review is essentially a brief report, prepared on an urgent basis, to reflect the highest level of evidence available regarding the subject at this specific time. The conclusion draws on restricted reviews from analysis of pertinent literature, on expert opinion and/or regulatory status where appropriate. All efforts have been made to ensure all relevant published material has been reviewed but this document may still not fully reflect all scientific research available. Additionally, other relevant scientific findings may have been reported since completion of this review.

TABLE OF CONTENTS

Short report on mandi wap herba (steam herbal bath) potential in COVID-19 management	4
Traditional and general use.....	4
Potential therapeutic effects.....	5
Chemical released from several herbs in steam bath	5
General therapeutic effects of steam bath	7
Safety of steam bath	9
Evidence of no adverse effects.....	9
Evidence of mild adverse effects	11
Evidence of severe adverse effects	12
Reported deaths	12
Conclusion	13
References.....	13

Short report on mandi wap herba (steam herbal bath) potential in COVID-19 management

Traditional and general use

- The use of medicinal plants is mainly reported in herbal bath or bath water, rather than in steam bath for a wide variety of ailments. There are reported use of plants in baths addressing viral infections such as *Morinda citrifolia* for human immunodeficiency virus 1 (HIV-1) and *Phyllanthus amarus* for hepatitis B. (1)
- Plant selection for use in steam baths is based on their organoleptic properties. Traditional healers recommend only bitter plants for such applications. However, in this study, steam baths mainly addressed dermatological and other infectious diseases. This study gathered use of steamed and inhaled *Justicia adhatoda* and *Achyranthes aspera* for nasal catarrh, *Blumeopsis flava* for colds, *Azadirachta indica* and *Melia azedarach* for pneumonia, *Phlogacanthus thyrsoiflorus* for dry cough, and *Curcuma longa* for influenza. Cautions are to be taken on weak patients with higher risk of emphysema. (2)
- Traditionally, there are five plants in Zambia that uses herbal steam bath for purpose of fever such as *Carica papaya* (a bunch of the leaves was boiled for 5 min and mixed with a bunch of *Psidium guajava* leaves boiled for 10 min), *Commiphora africana* (the bark and roots are used to make a steam bath for fever patients), *Helichrysum nudifolium* (make a steam bath by pouring an infusion of the roots on to hot stones), *Landolphia owariensis* (roots or green fruits are decocted to make a steam bath to treat fever pains) and *Olax obtusifolia* (roots are boiled to make a steam bath) (3).
- In highland Maya, steam bathing is a therapeutic strategy (usually referred to by the Nahuatl name *temazcalli*) that has always been used for many illnesses, especially for fevers caused by some chill (such as malarial chills) (4).
- However, many literatures reported herbal steam baths' role in postpartum therapy for puerperal fever resulting from microbial infections. Some of the plants mentioned are *Zingiber officinale* and *Alpinia galanga*. (5)
- An ethno-medico-botanical survey carried out in the ethnic group named Palliyars in Tamil Nadu mentioned fresh leaves of either *Ocimum tenuiflorum*,

Leucas biflora, *Anisomeles indica*, *Anisomeles malabarica* or *Azadirachta indica* is boiled and the vapour is inhaled for relief of headache, while *A. indica* stem bark is also boiled and the decoction is taken to control fever (6).

- A report on facial steam baths for respiratory ailments such as cough, colds, and headaches due to blocked sinuses are treated by taking a facial steam bath, prepared by boiling a mixture of herbs in water and the steam is inhaled while hanging over a bowl with a herbal decoction covering the head with a piece of fabric. Some do even take this treatment as a steambath or a sauna. The herbal mixtures mainly contain fragrant species such as *Citrus aurantiifolia*, *Cymbopogon citratus*, *Lantana camara*, and *Siparuna guianensis*. (7)
- The plant *Urena lobata* has a reported use for fever in a steam bath in Brunei (8).

Potential therapeutic effects

Chemical released from several herbs in steam bath

- **Tumeric**

Heat changes the composition of compounds found in turmeric. In fresh turmeric rhizomes subjected to heat treatment (in water bath) at different temperatures (60–100°C) for different durations (10–60 min), activity of polyphenol oxidase (PPO) was reduced when heated while PPO was nearly inactivated when heated to 80°C for 30 min. Total phenolic content (TPC) values increased gradually when samples were heated from 60 to 80°C. However, there was no documentation of atmospheric phytochemical content released during water heating in this study, or in other published studies. (9) One study isolated a nano carbon (named NC@TS) from smudges of turmeric resulting from direct burning of fresh turmeric rhizomes. Though some antibacterial properties were demonstrated in vitro in this study, there was no investigation on its antiviral and anti-inflammatory effects. (10)

- **Garlic**

Allicin, or Diallylthiosulfinate, is a volatile bioactive released from garlic. An in vitro study investigated that allicin vapour has demonstrated antibacterial effects (11); while in vitro antiviral assays against several viruses including, herpes simplex virus type 1, herpes simplex virus type 2, parainfluenza virus type 3, vaccinia virus, vesicular stomatitis virus, and human rhinovirus type 2 have shown that garlic extracts containing allicin have some virucidal effects. However, the mechanism remains unclear and the results of garlic extract

cannot be directly inferred to garlic vapour. Furthermore, it was also found that the composition of various commercial garlic products, including garlic powder tablets and capsules, oil-macerated garlic, steam-distilled garlic oils, etc. varies depending on method of preparation. (12)

- **Ginger-** Ginger extract inhalation has been reported to be beneficial for nausea and vomiting post-surgery in a randomised clinical trial involving 70 patients, against placebo. (13) Despite popular internet claims of the immune enhancing effects of ginger tea and extracts, a recent systematic review (published in 2020) of 109 human randomised controlled trials conducted on ginger reported that ginger extracts are most commonly investigated for nausea and vomiting instead, while there were only two studies which reported potential anti-inflammatory effects in arthritis patients. Therefore, there is insufficient evidence to support the claims on ginger's immune enhancing effects. Furthermore, all these studies were conducted with orally ingested ginger extracts with limited evidence on the benefits specifically for ginger vapour inhalation. Limitations of currently published papers include small sample size and use of unstandardised evaluation systems, as better designed trials are required in the future. (14)

- **Lengkuas**

There is limited evidence on the benefits of inhaling heated *Alpinia galanga* as an antiviral, anti-inflammatory, and immunostimulatory agent. Nevertheless, an *in vitro* study on methanol, acetone, and diethyl ether extracts of *Alpinia galanga* have demonstrated antibacterial effects against gram negative bacteria. (15) Another *in vivo* study investigating 1'-acetoxychavicol acetate (ACA) isolated from *Alpinia galanga* rhizomes in a mouse model of ovalbumin (OVA)-induced asthma reported that 1-ACA have anti-inflammatory and immunomodulatory effects of by inhibiting expression of the Th2 cytokines interleukin (IL)-4 and IL-13, and Th1 cytokines IL-12 α , and interferon- γ . (16) However, more studies will be required to further evaluate if steam herbal baths containing lengkuas can yield this potential bioactive compound 1-ACA.

- **Habbatus Sauda/ Black cumin seed**

Extracts of *Nigella sativa* seed have shown potential antiviral and immunomodulatory activities experimentally. However, efficacy is seen among different virus species and strains, which may not resemble the structure or pathogenesis similar to the coronavirus species (severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)) implicated in COVID-19. Current evidence is still insufficient to claim effectiveness against the COVID-19 disease specifically, but may have a supportive effect in alleviating respiratory symptoms associated with it. Preparation and dosing are still in question as

no therapeutic standard has been established. As for safety, animal studies reported *N. sativa* seeds are relatively safe at low doses, but the thymoquinone compound requires further evaluation. (17)

General therapeutic effects of steam bath

- A randomised controlled trial evaluating the efficacy and safety of steam bath (herbal versus non herbal) in allergic rhinitis patients (n = 32/group) was conducted in Thailand, where steam bath is administered for 30 min thrice a week for four consecutive weeks. The herbal steam bath contains *Zingiber cassumunar* rhizome (75 g), *Curcuma longa* rhizome (75 g), *Kaempferia galanga* rhizome (75 g), *Acorus calamus* rhizome (20 g), *Tamarindus indica* leaves (15 g), *Cinnamomum camphora* (plant part not mentioned) (2.5 g), and *Dryobalanops aromatica* (plant part not mentioned) (2.5 g). Anterior or posterior rhinorrhea symptoms, including sneezing, nasal itching and nasal congestion, significantly improved from baseline though there was no actual control group to be compared to those who did not receive any intervention. Confounding factors such as environmental allergen was not accounted for. There was no statistical difference in symptoms resolution between those treated with steam bath versus herbal steam bath. There was no objective measurement of chemicals released in the steam during the steam bath while specific mechanisms remained unclear. (18)
- In 41 patients with chronic heart failure (mean age 68.3±13.5 years old), repeated low-temperature sauna bathing at 60°C for 15 min (five times a week for three weeks) shows increased heart rate. Sauna therapy increased the left ventricular ejection fraction (from 30.4±12.6% to 32.5%±12.8%, p = 0.023) and reduced plasma levels of norepinephrine (from 400±258 to 300±187 pg/mL, p = 0.015) and brain natriuretic peptide (from 550±510 to 416±431 pg/mL, p = 0.035) from baseline. There was also improvement of the six-minute walk distance (from 337±120 to 379±126 m, p < 0.001) in association with an improvement in flow-mediated dilation (FMD) (from 3.5±2.3% to 5.5%±2.7%, p < 0.001) and an increase in the number of circulating CD34(+) cells (p = 0.025). Changes in six -minute walk distance were correlated positively with those in the left ventricular ejection fraction and FMD and negatively with those in plasma levels of norepinephrine and brain natriuretic peptide levels. However, this paper represents the general effect of a steam sauna bath without addition of herbs, specifically in this population of patients with limited cardiology function at baseline, which cannot be generalised to the general public. It should be cautioned that there was no control group to compare to. (19)

- A prospective population-based study was conducted to investigate the association of sauna bathing with risk of dementia and Alzheimer's disease. The frequency of sauna bathing was assessed at baseline in the Kuopio Ischaemic Heart Disease population based prospective cohort study of 2,315 apparently healthy men aged 42–60 years old at baseline, with baseline examinations conducted between year 1984 and 1989. Hazard ratios (HRs) with 95% confidence intervals (CIs) for dementia and Alzheimer's disease were ascertained using Cox-regression modelling with adjustment for potential confounders. In analysis adjusted for age, alcohol consumption, body mass index, systolic blood pressure, smoking status, type 2 diabetes, previous myocardial infarction, resting heart rate and serum low density lipoprotein cholesterol, compared with men with only one sauna bathing session per week, the HR for dementia was 0.78 (95% CI: 0.57–1.06) for 2–3 sauna bathing sessions per week and 0.34 (95% CI: 0.16–0.71) for 4–7 sauna bathing sessions per week. The corresponding HRs for Alzheimer's disease were 0.80 (95% CI: 0.53–1.20) and 0.35 (95% CI: 0.14–0.90). The study concluded that in this male population, moderate to high frequency of sauna bathing was associated with lowered risks of dementia and Alzheimer's disease. (20)
- In a small study of 10 volunteers who took hyperthermic water baths, it was found that there was a relative reduction of B and T lymphocyte counts while increasing relative CD8+ T lymphocyte and natural killer (NK) cell counts. Whole-body hyperthermic bath also increased somatotrophic hormone (STH) activity in eight out of 10 volunteers. These effects were not observed as frequent in volunteers subjected to locally applied water baths. Small sample size of this study did not allow for statistically significant analysis and comparison between groups. (21)
- The potential preventative benefits of sauna baths (non-herbal; 1-2 times/week for 6 months) against the common cold was evaluated in 50 healthy volunteers (25 volunteers with regular sauna bath versus another 25 volunteers no baths). Sauna baths were carried out as follows: warm shower, drying, 8–12 minutes sitting or lying in the sauna room (80–95°C, humidity 10–30 g/m³), and lastly 15 minutes cooling and resting. There were significantly fewer episodes of common cold in the sauna group with no differences in duration and severity among these two groups. This study is underpowered to study such effects with small sample size and allocation to treatment is not randomised, while the mechanism of action remains unclear. (22)

Safety of steam bath

Evidence of no adverse effects

- Safety of herbal steam bath for the reduction of allergic rhinitis symptoms was evaluated in a single-blind randomized controlled trial at Thai Traditional and Alternative Medicine Hospital. The treatment group (n = 32) received herbal steam bath consisting of *Zingiber cassumunar* rhizome (75 g), *Curcuma longa* rhizome (75 g), *Kaempferia galanga* rhizome (75 g), *Acorus calamus* rhizome (20 g), *Tamarindus indica* leaves (15 g), *Cinnamomum camphora* (plant part not mentioned) (2.5 g), and *Dryobalanops aromatica* (plant part not mentioned) (2.5 g) and the control group (n = 32) received steam baths without herbs for 30 min thrice a week for four consecutive weeks. There were no serious adverse effects observed but one subject in the steam bath group experienced itching on the skin, but the complaint resolved after 10 minutes. (18)
- The safety of a unique chemical exposure regimen based on exercise, sauna and therapeutic nutrients was evaluated in 109 individuals who were sequentially enrolled into a sauna detoxification component of a multi-modal, long-term residential substance abuse treatment centre. Data from medical charts, client self-reports and Short Form Health Survey (SF-36) (a questionnaire that consists of eight scales yielding two summary measures: physical and mental health) responses indicated that the Hubbard sauna detoxification method was well tolerated, with a 99% completion rate, including one human immunodeficiency virus and nine hepatitis C positive clients. The regimen did not show serious adverse events, had a very low discontinuation rate and high client-reported satisfaction. The SF-36 data indicated improved physical and emotional symptoms. Therefore, further investigation of this sauna-based treatment regimen is warranted. (23)
- A cross-over study in which six male distance runners completed three weeks of post-training sauna bathing and three weeks of control training, with a three-week washout period showed that sauna bathing can be tolerated for half an hour immediately after a training run. (24)
- Hospitalised patients with advanced heart failure (HF), who had plasma levels of B-type natriuretic peptide (BNP) > 500 pg/mL on admission and BNP > 300 pg/mL regardless of more than one week of medical therapy were enrolled. Patients were enrolled from 19 health institutes, with 76 patients on Waon therapy (a therapy which means “soothing warmth or comfortable warmth that refreshes the patients’ mind and body”. In this therapy, the body is warmed in an evenly heated chamber for 15 min at 60°C. After the core body temperature has increased by approximately 1.0–1.2°C, the warmth is

retained by covering the patient for an additional 30 min, and finally, the patient drinks cold water corresponding to the amount of perspiration) and 73 control patients (mean age 66-years-old, men 61%, mean plasma BNP 777 pg/mL). Waon therapy was performed once daily for 10 days with a far infrared-ray dry sauna maintained at 60°C for 15 min, followed by bed rest for 30 min covered with a blanket. The plasma BNP, New York Heart Association (NYHA) classification, 6-min walk distance (6MWD), and cardiothoracic ratio significantly improved only in the Waon therapy group. Improvements in NYHA classification, 6MWD, and cardiothoracic ratio were significant in the Waon therapy group, although the change in plasma BNP did not reach statistical significance. No serious adverse events were observed in either group. The Waon therapy showed clinical advantages in safety and efficacy among patients with advanced HF. (25)

- The safety of thermal vasodilation therapy by far-infrared ray dry sauna in infants with severe chronic heart failure (CHF) caused by ventricular septal defect (VSD). Twelve infants (median age 2.5±0.9 months) with isolated VSD diagnosed by two-dimensional echocardiography were prospectively studied. All patients had CHF and were receiving medications, such as digoxin or diuretics, or both, at the time of the study. The sauna temperature was kept at 60°C (measured where the patient was positioned). The patient had a sauna bath for five minutes, once daily for four weeks, while being held by his or her mother. After the sauna, the patient was kept at rest while being held by his or her mother and kept sufficiently warm by blankets for 30 minutes. Blood pressure, heart rate, and core body temperatures were measured before and after sauna therapy. No patients experienced complications, such as dehydration, worsening dyspnea, or arrhythmia during sauna bathing. (26)
- The safety and efficacy of repeated 60°C sauna bathing in patients with chronic systolic CHF were assessed in 15 hospitalised CHF patients in stable clinical condition on conventional treatments. Sauna bathing was performed once per day for four weeks. Sauna bathing significantly improved exercise tolerance manifested by prolonged 6MWD (388±110 to 448±118 m), increased peak respiratory oxygen uptake (13.3±1.8 to 16.3±2.1 mL/kg/min), and enhanced anaerobic threshold (9.4±1.2 to 11.5±1.9 mL/kg/min). Four-week bathing significantly reduced plasma epinephrine (40 +/- 42 to 21 +/- 23 pg/mL) and norepinephrine (633±285 to 443±292 pg/mL). Sauna bathing reduced the number of hospital admission for CHF (2.5±1.3 to 0.6±0.8 per year). Repeated sauna bathing was safely completed without any adverse effects in all patients. Symptoms improved in 13 of 15 patients after four weeks. (27)

- The safety of Waon therapy was assessed in 10 CHF. The patients were placed in a sitting-position in an evenly maintained 60°C dry sauna system for 15 minutes, and then after leaving the sauna, they underwent bed rest with a blanket to keep them warm for an additional 30 minutes. This therapy was performed once a day, five days a week. It was found to be safe and improve heart failure symptoms (based on New York Heart Association classification) in some patients with CHF. No adverse events were recorded during the entire session. (28)
- A randomised controlled, cross-over trial was conducted (n = 9) to assess the safety of supervised sauna bathing at moderate temperatures in people with chronic heart failure. One group began a thrice-a-week, 4-week sauna bathing program at 60±1°C while the other continued with their usual activities and medications. Assignments were then reversed. Sessions were 15 minutes in length but were prolonged an additional five minutes for oral temperature increases less than 1.0°C. Sauna bathing was well tolerated and no adverse effects were reported. (29)

Evidence of mild adverse effects

- A systematic review covering 13 randomised controlled trials of dry sauna bathing on humans reported none or mild adverse effects such as decreased blood pressure, hypovolemia (reduced extracellular fluid), polyuria, decreased body weight and heat intolerance but there is no reported severe adverse effect involving the need for emergency medical services. Further studies to determine frequency and extent of adverse effects is suggested. (30)
- A prospective cohort study with a population-based sample of 2,315 middle-aged (42–60 years old) men from Eastern Finland showed that individuals who are prone to orthostatic hypotension should be cautious when sauna bathing because of a possible decrease in blood pressure, which typically occurs immediately after sauna bathing (31).
- A single exposure of sauna-naive men to 86°C for 20 min suppressed the sperm number per ejaculate from a mean from 250x10⁶ to 160x10⁶ in one week (p < 0.05). After the sauna, immediate increases were found in spermatozoa motility, glucose utilisation, and lactic acid accumulation. There were ultrastructural alterations in sperm, including swelling of plasma membrane, increase in immature forms, and disorganization of arrangement of mitochondria. However, the sperm appeared normal after six weeks. (32)

- Eight healthy subjects were exposed to sauna at a temperature of 80–90°C in the same sauna room for 30 min per day for two weeks. The study demonstrated a significant reversible decrease in sperm motility parameters, but not in numbers. The altered parameters returned to their original values within one week after cessation of sauna exposure. (33)
- Ten normozoospermic volunteers underwent two sauna sessions per week for three months, at 80–90°C, each lasting 15 min. At the end of sauna exposure, a strong impairment of sperm count and motility ($p < 0.001$) was found, while no significant change in sex hormones was present. Decreases in the percentage of sperm with normal histone-protamine substitution ($78.7\% \pm 4.5$ versus $69.0\% \pm 4.1$), chromatin condensation ($70.7\% \pm 4.7$ versus $63.6\% \pm 3.3$) and mitochondrial function ($76.8\% \pm 4.9$ versus $54.0\% \pm 6.1$) were also evident comparing T0 = before sauna exposure vs T1 = after 3 months of sauna sessions, and strong parallel up-regulation of genes involved in response to heat stress and hypoxia was found. All these effects were completely reversed at 6-month from the end of sauna exposure. (34)

Evidence of severe adverse effects

Contraindications: An analysis of 54 death reports by medical examiners and those reported to United States Consumer Product Safety Commission (CPSC) showed that severe aortic stenosis, unstable angina pectoris, and recent myocardial infarction are contraindications to sauna bathing. Decompensated heart failure and cardiac arrhythmia are relative contraindications. Although sauna bathing by patients with a history of stroke or transient ischemic attacks has not been studied, it should be avoided until the condition stabilizes. Elderly persons prone to orthostatic hypotension should be cautious in the sauna because a decrease in blood pressure may cause syncope, usually just after sauna. (35)

Reported deaths

- Spas and saunas related fatalities were studied from 1986 to 1988. Only seven of the 158 deaths analysed occurred in saunas, whereas the remaining 151 deaths occurred in spas, jacuzzis, or hot tubs. The main risk factors identified were alcohol ingestion (38%), heart disease (31%), seizure disorders (17%), and cocaine ingestion; alone or in combination with alcohol ingestion (14%), which accounts for 71 or 44.7% of the 158 fatalities. Sixty-one of the 151 spa-associated deaths occurred in children under 12-years-old. Accidental drownings from uncovered or improperly covered spas and, to a lesser extent, entrapment by suction, were the main causes of children drownings. It was noted that children and older persons who have heart disease or seizure disorders or who use alcohol or cocaine are especially vulnerable. Recommended preventive measures include shortening the time

of exposure, lowering the temperature, establishing safety standards for covers and for baffles for suction outlets, and using warning notices. (36)

- A retrospective study on police and forensic autopsy reports, death certificates, and toxicological results of deaths occurring while in a sauna in Finland (year 1990–2002) showed that the annual rate of death occurring while in a sauna was less than two per 100,000 inhabitants. Although 51% was due to natural death and 25% due to exposure to heat, 50% of all cases were under the influence of alcohol, which means the role of alcohol as a risk factor should be studied. (37)
- A retrospective study on deaths from year 1992 through 2003 related to sauna in Sweden showed that out of 65 cases, majority were 34 (44%) of these deaths were related to alcohol and 18 (23%) cardiovascular (38).

Conclusion

Although there was a RCT study on steam herbal baths that showed improvement of sneezing, nasal itching, and nasal congestion for allergic rhinitis, the herbs used are not similar to the one listed by the enquirer and it doesn't show antiviral effects. In general, due to heat application, it is reasonable to expect increased heart rates and dilation of blood vessels. However, there is no evidence of steam herbal baths dilating nerves nor is there evidence of objective correlation between increasing heart rates, blood vessel dilation, and antiviral or immune enhancing effects. As for the chemical release of herbs, there is still limited evidence in terms of atmospheric phytochemical content or bioactive compounds released during water heating, method of preparation, and standardised evaluation systems. In terms of safety, majority reports show none or mild adverse effects although death cases have been reported due to concurrent alcohol intake and contraindicated cardiovascular conditions. Our recommendation is that further research needs to be conducted on its efficacy and its safety before it can be considered for traditional & complementary medicine services. These services should comply with the Acts available in the country guided by a practice guideline and conducted by qualified personnel.

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