



Response to Covid-19 Disease in Ghana: A Review of the Herbs

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Abstract

The majority of people living in developing countries rely on alternative medicine for many aspects of their healthcare needs. Throughout the COVID-19 pandemic, a lot of alternative treatments have been adopted in a bid to prevent contracting and sometimes purported to cure the disease. However, the adopted medicinal plants are mainly arbitrary and have not been captured nor reviewed in the light of available knowledge. In this review, we examined the herbs, fruits, vegetables and other alternative therapies that have been employed by many Ghanaians with the aim of COVID-19 disease prevention. The majority of these herbs are medicinal plants known to have antiviral activities, while others boost the immune system.

Keywords: COVID-19, Herbs, Preventive Therapy

1. Introduction

The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), commonly known as COVID-19 has created an unimaginable healthcare crisis¹. Since December 2019, when the pandemic started, the disease has spread unprecedentedly to almost all parts of the world over all five continents. COVID-19 is responsible for more than 10,000,000 infections and approximately 55,000 deaths worldwide, covering over 203 countries³. In March, 2020 Ghana registered its first COVID-19 case. The cases have since risen steadily to 47,202 with 320 deaths as at November, 2020⁴. Ghana is however believed to have one of the lowest death rates from COVID-19⁵, and this could be attributed to several factors but not limited to a milder manifestation of the disease, immunological factors, cultural and environmental factors, preventive therapy, and even behaviour changes.

There is currently no cure for COVID-19, hence the disease is managed symptomatically. Due to the urgent need for treatment options, current drugs are rather being repurposed as potential covid drugs are frantically being sought for⁶. The pandemic has resulted in changes to

various aspects of life in the Ghanaian society including dietary modifications, the increased usage of herbs, and appropriate social and behavioural changes. In order to curtail community spread, and reduce the incidence of fatality from the disease, as well as adopt strategies that are less costly, equitable, and easily accessible, this paper reviews herbs, fruits and vegetables that have been commonly used in Ghana, and are believed to be beneficial in the prevention of COVID-19.

2. Medicinal Plants

Medicinal plants widely mentioned as being used by various households in the Ghanaian society to help in the prevention of COVID-19 disease were listed as ginger (*Zingiber officinale*), citrus fruits lemon (*Citrus limon*) lime (*Citrus aurantifolia*) orange (*Citrus sinensis*) neem leaves (*Azadirachta indica*), 'sobolo' (*Hibiscus sabdariffa*), 'prEkEsE' (*Tetrapleura tetraptera*), garlic (*Allium sativum*), onions (*Allium cepa*) and moringa (*Moringa oleifera*). Other plants are green tea (*Camellia sinensis*), dandelion (*Taraxacum officinale*), 'hwentea' (*Xylopiya aethiopica*),

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cloves (*Syzygium aromaticum*), pawpaw (*Carica papaya*), pepper (*Capsicum annuum*), mint (*Mentha piperita*), 'dawadawa' (*Parkia biglobosa*) and 'nunum' (*Ocimum gratissimum*)⁷.

Ginger: The rhizomes of *Zingiber officinale*, is a common spice belonging to the family Zingiberaceae. This plant is widely for the prevention of COVID-19, it is used in higher quantities in cooked foods, fruit juices and singly chewed. Ginger possesses several biological properties such as anti-inflammatory, antioxidant, antimicrobial, and antiviral among others^{8,9}. Fresh ginger is especially known to have antiviral activity¹⁰. Compounds from ginger have recently been shown to bind with high *in silico* affinity to closed d conformer, and hence are potential SARS-CoV-2 PLpro inhibitors³.

Citrus: Citrus fruits which include orange (*Citrus sinensis*), lemon (*Citrus limon*) and lime (*Citrus aurantifolia*) belong to the family Rutaceae. The juices of these fruits are drunk freshly prepared. Citrus flavonoids have a wide range of therapeutic benefits such as antiviral properties¹¹. Among the flavonoids, hesperidin has recently been shown to bind to the key proteins of the COVID-19 virus being "spike" protein, and the main protease that transforms the early proteins of the virus (pp1a and pp1b) into the complex responsible for viral replication. The affinity of hesperidin for these proteins is comparable to that of common antiviral compounds¹².

Kaempferol, a natural flavanol found in lime, is widely used in balms, vaporisers and inhalers as an anti-congestive¹³. Citrus fruits aside their delicious appeal are a common go-to fruit in Ghana for treating colds, boosting the immune system as a result of its vitamin C and high fiber content¹⁴.

Neem Leaves: Neem (*Azadirachta indica*), is from the family Meliaceae. The leaves are used in steam inhalations for malaria, flu and cough in Ghana¹⁵. During the COVID-19 pandemic, the leaves have been used as an inhalant to treat the symptoms of flu and coughs. Some compounds from the leaves of this plant have been shown to exhibit high binding affinity against COVID-19 through Molecular Docking Studies^{1,16}. Again, it has demonstrated a wide antiviral activity against both DNA and RNA viruses¹⁷.

Hibiscus Tea: Commonly known as 'sobolo' or 'bissap', Hibiscus tea is a local drink prepared from the sepals of *Hibiscus sabdariffa* by decoction in water¹⁸. This is reportedly being drunk to help in COVID-19 prevention.

High antiviral effects of hibiscus tea extract on the H5 subtypes of both low and highly pathogenic avian and influenza viruses¹⁹ and Human Influenza A²⁰ have already been reported and this information could inform its use as a preventive against viral infection.

Tetrapleura tetraptera: Locally known among the Akans of Ghana as 'prEkεε' (family Leguminosae), the matured fruit is used as a condiment in soups²¹. Folklorically, the matured fruit is again used as an antidiabetic and an anti-inflammatory agent as well as for treating fever^{22,23}. Currently it is used to prevent COVID-19 infection. However, very little is known about the antiviral activity and anti-COVID-19 activity of this plant.

Garlic and Onion: Onion (*Allium cepa*) and garlic (*Allium sativum*) (family Amaryllidaceae) are both known to have antiviral activities²⁴. Garlic has inhibitory effects on avian infectious bronchitis²⁰. The volatile oils found in garlic are chiefly made up of organosulfur compounds. These compounds show strong interactions with the amino acids of the ACE2 protein and the main protease PDB6LU7 of SARS-CoV-2. Of these, allyl disulfide and allyl trisulfide which are the most abundant, show the most potent anti-coronavirus activity²⁵. Garlic's broad antimicrobial spectra and its ability to modulate immunity may play a strategic role in the acquired immunodeficiency syndrome pandemic²⁶. Garlic and onions are a key component in Ghanaian meals²⁷. Aside that, they are locally eaten fresh for treating a myriad of illnesses including hypertension, colds and coughs²⁸.

Moringa oleifera: *M. oleifera* which is a member of the Moringaceae family has been demonstrated to be therapeutically active against DNA and RNA viruses¹⁷ and also boost the immune system during immunosuppression. Modulation of the immune system by various plant materials is one approach to protect against many diseases²⁹. Folklorically, its leaves are favoured in food and taken as an immune booster for general wellbeing^{30,31}.

Camellia sinensis: Commonly known as green tea, *C. sinensis* is a member of the family Theaceae. It is taken as an everyday beverage locally. A hot infusion of this tea mixed with lemon or lime juice is drunk locally to relieve colds³². Some docking studies have emphasised the activity of tea polyphenols against COVID-19³³. The polyphenols epigallocatechin gallate, epicatechingallate and gallic acid possess favourable drug-like characteristics and interact strongly with one or both

catalytic residues (His41 and Cys145) of Mpro. They have been demonstrated to be potential inhibitors against SARS CoV-2 Mpro. They are thus pegged as possible lead compounds for COVID-19 drug development^{33,34}.

***Taraxacum officinale*:** *T. officinale*, commonly known as dandelion³⁵ is a member of the Asteraceae family. Aqueous extracts from dandelion have been shown to possess anti-influenza virus properties by inhibiting viral replication³⁶. It is locally eaten as salads or cooked in stews and soups and for the treatment of diabetes and hypertension^{37,38}.

***Xylopi aethiopica*:** This plant belongs to the family Annonaceae. The fruit is aromatic and widely used as a spice. It is an essential spice in Ghanaian dishes and is employed in many herbal preparations. It is traditionally used to treat bronchitis, asthma and other inflammatory conditions. The dried fruit is inhaled as a decongestant³⁹. This plant is known to have significant activity against the measles virus⁴⁰.

***Syzygium aromaticum*:** Commonly known as cloves, it belongs to the family Myrtaceae. Together with ginger, it provides protection from foodborne viral contamination⁹. Folklorically, clove is a favoured condiment in Ghanaian cooking and traditional medicine. It is used in aromatherapy where it is inhaled together with *Xylopi aethiopica* for its nasal decongesting effects and soothing properties^{41,42}. Currently it has been used in food and as an inhalant to prevent COVID-19 infection.

***Carica papaya*:** *C. papaya* is a member of the family Caricaceae. Both the fruit and leaves have been used locally as medicine from time immemorial⁴³, and currently implicated in the prevention of COVID-19 disease. Pawpaw or papaya contains papain and chymopapain which are proteolytic enzymes with antiviral, antifungal and antibacterial effects⁴⁴. Research has shown that pawpaw extract and its compounds acetogenins inhibit the production of ATP, a fact that accounts for its reported antiviral, antitumor and pesticidal effects⁴⁵. The leaves of pawpaw are traditionally used as medicines for varied illnesses and has been shown to be beneficial as an immune-modulatory and antioxidant agent⁴³. This tropical fruit is enjoyed locally as a rich source of vitamins, especially vitamins A, B and C^{46,47}. The vitamins promote a healthy immune system and helps to reduce the infection rate for common colds and coughs⁴⁴.

***Capsicum annum*:** *Capsicum* is a genus belonging to the family Solanaceae or the nightshades. Some peppers including chili, sweet, and black peppers are known to have various antiviral activities⁴⁸⁻⁵¹. Regular intake of chili peppers was linked to the observed lower rates of total mortality and CVD mortality in a large population of Italian adults. The finding occurred independently of CVD risk factors or adherence to a Mediterranean diet⁵². Pepper forms an essential part of the Ghanaian hot and spicy cuisine. Aside being an important spice, pepper is used in traditional Ghanaian medicine to relieve colds and prepared in the form of pepper soups for convalescents to speed up their recovery⁵³.

***Mentha piperita*:** There are several reports showing that various peppermint extracts have significant antiviral activities as well as help to improve immune system and protect the body from viruses^{40,54,55}. *Mentha piperita* is among several plants shown to have antiviral activity against avian infectious bronchitis virus. This virus belongs to the Coronaviridae family⁵⁶.

***Ocimum gratissimum*:** Commonly called 'nunum', it belongs to the family Lamiaceae. The leaves of this plant inhibit HIV-1 strain⁵⁷. *O. gratissimum* has widespread use in Ghanaian traditional system of medicine to cure various diseases. The plant is known to have antibiotic and antioxidant activities among several other properties⁵⁸⁻⁶⁰. Very little is known about its antiviral activity, but it may possibly enhance the immune system^{61,62}.

3. Dietary Changes

Dietary changes adopted during this period mainly included an increase in the consumption of the above-mentioned herbs, as well as fruits and vegetables. Plant-based diets are known to improve overall gut microbiome health which makes up to 85% of the body's immune system⁷. Reports were also made on the use of food supplements.

4. Food Supplements

Vitamin C: Vitamin C is a therapeutic agent for many diseases and acts by boosting the immune system, and helping to fight off infections⁸. Vitamin C supplements are known to shorten the duration of the common cold, but they do not reduce the risk of contracting colds. It is believed that, it is this effect of vitamin C that has fuelled its use as a potential treatment for COVID-19⁶³.

Zinc Supplementation: Zinc (Zn) is an essential trace element that is vital for the maintenance of immune function as well as for growth and development. Zinc deficiency is a risk factor for getting viral infections as zinc is able to influence antiviral immunity⁶⁴. Co-administration of zinc with the standard antiviral regimen for SARS viruses is said to produce a synergistic effect to bring relief. Zn may also protect or stabilise the cell membrane hence blocking viral entry into the cell and inhibiting viral replication. Zn diminishes the RNA-synthesising activity of nidoviruses, for which SARS-CoV-2 belongs. Therefore, it is hypothesised that zinc intake is beneficial as prophylaxis and treatment of COVID-19⁶⁵.

5. Alternative Therapy

5.1 Throat Gargling

Cleaning the throat with salt solution and vinegar has been practiced by some Ghanaians. Studies have shown that during the first week of SARS-CoV-2 infection, the salivary viral load is at its peak hence the disease transmission and severity at this stage is high. Reducing the viral load at this stage ultimately helps to reduce the transmission rate⁶⁶. A randomized trial study in Japan demonstrated that Upper Respiratory Tract Infections (URTI) could be reduced significantly by 36% simply by gargling tap water thrice daily⁶⁷. This is suggestive that encouraging gargling with water or saline can reduce viral load in the oropharynx and hence reduce transmission and severity of the disease.

5.2 Water Intake

It has been proposed that drinking water every 15 minutes might flush out the coronavirus and protect one from COVID-19. However, this has not been proven. Epidemiological evidence rather supports the fact that sub-optimal hydration in the period before infection might increase risk of COVID-19 mortality⁶⁸. Good hydration keeps the mucous membranes moist thus lowering the chances of infection⁷. Hence, adequate hydration is essential for COVID-19 prevention.

5.3 Hot Baths and Steam Inhalation

The benefits of hydrothermal therapies such as hot baths have been known for thousands of years and have been shown to be effective for disease prevention and health promotion⁶⁹. Hot baths have been a remedy for colds and catarrhs since time immemorial⁷⁰. The inhalation

of steam arising from the hot baths relieves flu sufferers of nasal and bronchial congestion hence improves breathing. A similar phenomenon is also seen in COVID-19 disease. Sometimes, the water is boiled with medicinal plants such as neem and pepper and inhaled to achieve bronchial decongestion^{39,53}.

7. Conclusion

Many preventive measures have been adopted by people all over the world in a bid to combat the COVID-19 pandemic. Looking at the low incidence of deaths to COVID-19 in Ghana, it may just be worthwhile further investigating these herbs and dietary changes for the prevention of COVID-19.

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9. Conflict of Interest

The authors declare no conflict of interest.

10. References

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