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EXPLORING THE PHARMACOLOGICAL POTENTIAL OF MUKKAMUKKUDUKA-DI GUTIKA IN DISEASES OF PRANAVAHA SROTAS WITH SPECIAL EMPHASIS ON INFECTIOUS RESPIRATORY DISEASES CAUSED BY AIRBORNE PATHOGENS

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ABSTRACT

The environment and the elements occupying it are continuously attached to our existence and a healthy environment is always quite essential for a healthy life. Respiration is the one continuous inevitable process that keeps the body alive. But recent centuries have witnessed the emergence of various factors and diseases which can weaken a person's respiratory system, weaken immunity, and cause respiratory system-based disorders which can either be because of pollution or urban reasons or due to pathogens that mainly transmit diseases through air that we breath. Air borne pathogens are responsible for various infectious diseases that transmit from one person to another via close contact, coughing, sneezing, droplets, and aerosols. They have been the cause of pandemics that have wrecked the health status of society and made health systems develop newer and potent drugs and remedies that can combat the diseases caused by these infectious air borne pathogens, at the same time improve the immunity of the compromised serving as a preventive and prophylactic medicine as well. The ayurvedic medical system in this regard has impressed the whole world by educating the world on its opinion on air borne pathogens in the context of *Aupasargika vyadhi* and *Janapadodhwamsa*, its relationship to the environmental factors and by opening its miraculous herbal formulations which were inscribed in ancient classical literature that could combat and overcome the diseases caused by air borne pathogens. *Mukkamukkudukadi gutika* is one such formulation mentioned in the text *sahasrayogam* which has been used most commonly by ayurvedic physicians in south india to combat different types of fever and its associated symptoms. The article is intended to check the pharmacological

potential of *Mukkamukkuduvadi gutika* in combating infectious respiratory diseases caused due to airborne pathogens.

Keywords: Airborne pathogens, *Aupasargika roga, Janapadodhwamsa, Mukkamukkudadi gutika*, respiratory system disorders, Infectious air borne diseases.

INTRODUCTION

Respiration is the one bodily function responsible for the sustenance of life. Breath is the main characteristic feature of the presence of life in a person and life ends with the cease of respiration. But drastically changing environmental factors and the increased presence of pathogens that are airborne and capable of transmitting infectious diseases via Air, respiration, aerosols, droplets, and close contact have increased the prevalence of incidence of air borne infectious diseases within the world population.

Airborne pathogen-induced infectious diseases are the focus of study for medical researchers and healthcare professionals all over the world due to the recent outbreak of Covid-19. Infectious diseases caused by air borne pathogens spread rapidly from one person to another due to the close contact and higher transmission rate of such pathogens. Even though masks, sanitizer, and such preventive measures could keep the transmission of such infectious air-borne pathogens at bay, medical intervention is required to prevent the progress of the disease in an already infected person, to increase the immune status in an uninfected person, and to prevent a recurrence, improve the compromised immunity and overcome the associated symptoms and conditions that manifest post-infection.

In the search for a medicinal system that can propose a systematic approach towards the goal of combating, preventing, and managing these infectious diseases, at the same time promoting the immune status of the individual reducing the chances for recurrence, emerges the medicinal system of ayurveda along with its herbal formulations that can satisfactorily and successfully fight these airborne pathogens with the virtue of their pharmacological properties and cumulative action.

The concept of infectious diseases is explained in depth in the classical literatures of ayurveda. Looking at the chapters of the classical literatures, infectious diseases are explained under 5 main chapters, *Jwara, Krimi, Visha, Rtucharya, and Janapadoshwamsa*. Jwara refers to the fever which is the most common and primary symptom that manifests in an infectious disease. The term *Krimi* in ayurveda encompasses all the microscopic microbes and parasites, worms, viruses, etc.(1)

According to ayurveda, among the various classifications of *jwara*, infectious diseases are usually considered under the context of *sannipata and abhinyasa* where primarily the manifestation starts in the respiratory system or the *pranavaha srotas.* (2) characterized mostly by symptoms like *pratishyaya, shwasa, kasa,* etc.

Mukkamukkadukadi gutika is a renowned and well-used ayurvedic drug formulation mentioned in the text *Sahasrayogam, Gutika prakaranam(3).* Sahasrayogam being a text based on the traditional ayurveda medicines of Kerala, has been commonly and frequently used by ayurvedic physicians of Kerala for different types of fevers as an add-on medication as well as primary medication. In the formulation, it is specifically indicated for *Abhinyasa jwara, Swasa, kasa, sannipata jwara, vatadosha prakopa*(4). Looking at the ingredients within the formulation, the majority of the ingredients in yoga are advised for diseases related to the respiratory system and immune systems.

Aim of the Study

The aim of the current study is mainly to assess and understand the pharmacological potential of the ingredient drugs as well as the formulation *"Mukkamukkadukadi Gutika*" as a whole for its antimi-

crobial and immunomodulatory activity in infectious respiratory diseases caused by air borne pathogens.

Materials and Methods

Relevant information regarding the formulation and the ingredients with special emphasis on their pharmacological properties and actions were referred to and collected from various *samhitas* and *Nighantus*. All available information on the drugs was collected online from authentic articles published. The source plant and their botanical names and families were cross-referenced for the study. Pharmacological evaluations conducted with the drug and its used parts were collected from research articles available online through the PubMed search engine.

Pharmacological actions of the ingredient drugs that were already published which were relevant to the current study were considered and analyzed to prove the pharmacological potential of the formulation.

Ingredients of *Mukkamukkadukadi Gutika(5)*

1. *Haritaki - Terminalia chebula [Gaertn]Roxb.*
2. *Amalaki – Phyllanthus emblica Linn.*
3. *Vibheetaki – Terminalia ballerica [Gaertn]Roxb.*
4. *Shunthi - Zingiber officianale Rosc.*
5. *Maricha – Piper nigrum Linn.*
6. *Pippali - Piper longum Linn*
7. *Kiratatikta - Andrographis paniculate [Burm.]Wall ex Nees*
8. *Swetajeeraka - Cuminum cyminum Linn.*
9. *Krishnajeeraka – Carum carvi Linn.*
10. *Vacha – Acorus calamus Linn.*
11. *Jatiphala - Myristica fragrans Houtt.*
12. *Kanyasara - Aloe barbadensis Mill.*
13. *Saindhava – Rock salt*
14. *Hingu - Fenula foetida Regel*
15. *Lavanga - Syzygum aromaticum [Linn.]Merr. & L.M.Perry*
16. *Kustha - Saussurea lappa [Decne.]Sch.-Bip*
17. *Karpoora - Cinnamomum camphora [Linn.]Presl*
18. *Twak - Cinnamomum zeylanicum Blume*
19. *Kankola - Piper cubeba Linn.f*
20. *Rasona - Allium sativum Linn.*
21. *Ajamoda - Apium graviolens Linn.*
22. *Nirgundi - Vitex negundo Linn.*

Indications of *Mukkamukkadukadi Gutika(6)*

1. *Sannipata jwara / Abhinyasa Jwara* – Infectious diseases caused due *to tridosha dusti.*
2. *Sutika roga* – Gynecological disorders
3. *Swasa* – Respiratory distress
4. *Kasa* - Cough
5. *Vatadusti* – Diseases caused due to *Vata dosha.*

Method of Preparation

All 21 ingredient drugs are collected washed, dried, powdered, and triturated in *Nirgundi swarasa* for 4 *yama* and rolled into gutika in the size of a peanut, dried in the shade, and stored in an airtight container. The *gutika* is consumed along with warm water or appropriate *anupana* as per *the dosha* involved.

Dosage

Dosage is usually fixed after assessing the severity of the fever and its associated symptoms.

Table 1: Ingredient drugs with their botanical name and part used.

Drug	Botanical name	Family	Used part
Hareetaki	*Terminalia chebula [Gaertn]Roxb.*	Combretaceae	Dried fruit
Amalaki	*Embilica officianalis Linn.*	Euphorbiaceae	Dried fruit
Vibheetaki	*Terminalia bellerica [Gaertn]Roxb.*	Combretaceae	Dried fruit
Sundi	*Zingiber officianale Rosc.*	Zingiberaceae	Dried rhizome
Maricha	*Pipper nigrum Linn.*	pipperaceae	Dried fruit Dried fruit
Pippali	*Pipper longum Linn.*	pipperaceae	Dried fruit
Kiratatiktha	*Andrographis paniculate [Burm.]Wall.*	acanthaceae	Dried whole plant
Swetajeeraka	*Cuminum cyminum Linn.*	Apiaceae	Dried fruit
Krishnajeeraka	*Carum carvi Linn.*	Apiaceae	Dried seed
Vacha	*Acorus calamus Linn.*	Acoraceae	Dried rhizome
Jateephala	*Myristica fragrans Houtt.*	Myristicaceae	Dried seed

Kanyasara	*Aloe barbadensis Mill.*	Liliaceae	Processed Leaf juice
Saindhava	*Rock salt*	-	-
Hingu	*Fenula foetida Regel*	Apiaceae	Resinous exudate
Lavanga	*Syzygum aromaticum [Linn.]Merr*	Myrtaceae	Dried flower
Kushta	*Saussurea lappa [Decne.]Sch.-Bip*	Asteraceae	Dried root
Karpura	*Cinnamomum camphora [Linn.]Presl*	Lauraceae	Deposits in cell oil
Twak	*Cinnamomum zeylanicum Blume.*	Lauraceae	Dried stem bark
Kankola	*Piper cubeba Linn. f*	Pipperaceae	Dried unripe berries
Rasona	*Allium sativum Linn.*	Alliaceae	Bulb
Ajamoda	*Apium graviolens Linn.*	Apiaceae	Dried fruit
Nirgundi	*Vitex negundo Linn.*	Laminaceae	Dried root/stem

Pharmacological properties of drugs in *Mukkamukkadukadi Gutika (7)*

Ayurveda considers the mode of action of drugs can be attributed to their pharmacological properties or the *rasa panchaka*. *Acharya vagbhata in Astanga hridaya*, *sutrasthana*, chapter 9 explains that the action of the drug can be brought about by the virtue of its *Rasa*, *guna*, *virya*, *vipaka*, or even *prabhava*. In the case of compound formulations including various drugs, the pharmacological potential of the formulation can be assessed or understood by deep analysis of the pharmacological actions exhibited by its individual drugs.

Table 2: Pharmacological properties of ingredient drugs

Drug	***Rasam***	***Gunam***	***Virya***	***Vipaka***
Hareetaki	*Bha. Pr – Pancharasa Lavana Varjita Su. Sa* *Dha. Ni - Pancharasa Lavana Varjita Cha. Sa* *Ra. Ni – Pancharasa Lavana Varjita A.Hr* *Ni. Ra – Pancharasa Lavana Varjita Kai.Ni*	*Ruksha, Ushna Laghu* *Ni Ra - Sara*	*Ushna*	*Madhura*
Amalaki	*Dha.Ni – Pancharasa Lavana Varjita Ra. Ni – Amla, Kashaya, Madhura, Katu* *Su. Su – Pancharasa Lavana Varjita Ni. Ra – Pancharasa Lavana Varjita* *Kai.Ni – Amla, Madhura, Kashaya*	*Laghu, Ruksha*	*Sita*	*Madhura*
Vibheetaki	*Bha. Pr – Kashaya, Su. Sa - Kashaya* *Ra. Ni – Katu, Tikta, Kashaya Ni. Ra – Katu, Tikta*	*Laghu, Ruksha*	*Ushna*	*Madhura* *Dha.Ni (Katu)*
Sunthi	*Bha. Pr - Katu, Ra. Ni – Katu* *Su. Sa – Katu, Kai.Ni -Katu* *Dha.Ni – Katu*	*Laghu, Snigdha, Ruksha Ushna*	*Ushna*	*Madhura*
Maricha	*Ma. Ni – Katu, Ni. Ra – Katu, Tikta* *Bha. Pr – Katu, Kai.Ni - Katu* *Dha, Ni – Katu*	*Laghu, Rusha, Teekshna*	*Ushna*	*Katu*
Pippali	*Ma. Ni – Katu, Bha. Pr – Katu, Madhura* *Kai.Ni – Katu, Madhura Dha.Ni – Kaatu, Madhura* *Ra. Ni – Katu, Tikta*	*Laghu, Snigdha*	*Anushna*	*Madhura*
Kiratatiktha	*Ra.Ni – Tikta, Dha.Ni – Tikta*	*Laghu*	*Anushnoshita*	

Swetajeeraka	*Ma.Ni – Katu Bha. Pr – Katu* *Dha.Ni – Katu Ra.Ni – Katu* *Ni.Ra – Katu, Tikta ,Kai.Ni – Katu, Tikta*	*Laghu, Ruksha*	*Ushna*	*Katu*
Krishnajeeraka	*Ma.Ni – Tikta, Ni.Ra – Katu, Tikta*		*Ushna*	*Katu*
Vacha	*Bha. Pr – Katu, Tikta Ma.Ni – Tikta* *Ra.Ni – Katu,Tikta , Kai.Ni – Tikta, Katu* *MA. Pa. Ni – Katu, Tikta*	*Laghu, Ruksha*	*Ushna*	*Katu*
Jateephala	*Bha. Pr – Tikta, Katu , Ra.Ni – Kashaya, Katu* *Dha.Ni – Kashaya, Katu*	*Tikshna, Ushna, Laghu*		
Kanyasara	*Ra.Ni – Katu*	*Guru*	*Sita*	
Saindhava	*Cha. Sa – Lavana Madhura*	*Vidahi*		*Madhura*
Hingu	*Su.Sa – Katu Cha. Su - Katu* *Dha.Ni – Katu Shaa. Sa – Katu* *Kai.Ni – Tikta, Katu Ra.Ni – Katu* *Ni.Ra – Katu, Tikta*	*Snigdha* *Sara* *Ushna, Tikshna*	*Ushna*	*Katu*
Lavanga	*Bha. Pr – Katu, Tikta, Su.Sa – Tikta, Katu* *Ra.Ni – Tikta*	*Laghu, Tikshan*	*Sita*	*Madhura*
Kushta	*Ma.Ni - Tikta, Katu , Dha.Ni – Katu, Tikta* *Bha. Pr – Katu, Madhura, Tikta* *Ni. Ra – Katu, Tikta, Ra.Ni – Katu,Tikta Kai.Ni – Tikta, Katu, Madhura*	*Laghu*	*Ushna*	
Karpura	*Bha. Pr – Tikta Ra.Ni – Katu, Tikta* *Gu . Pa – Katu, Tikta*	*Snigdha, Ushna*		
Twak	*Bha. Pr – Madhura, Tikta Ra.Ni – Katu* *Sha. Ni – Madhura, Tikta*	*Laghu, Tiksha*	*Ushna*	
Kankola	*Bha. Pr- Tikta Ni. Ra – Katu, Tikta* *Dha.Ni – Katu, Tikta Kai. Ni – Tikta* *Ra.Ni – Katu, Tikta*	*Laghu, Tikshna* *Usha*	*Ushna*	
Rasona	*Bha. Pr – Amla Varjita Pancharasa* *Su.Sa – Katu, Madhura Cha . Sa – Katu* *Dha.Ni – Katu, Madhura Kai.Ni - Katu*	*Snigda, Sara* *Tikshna, Guru* *Pichila*	*Ushna*	*Katu*
Ajamoda	*Ma.Ni – Katu Ni.Ra- Katu* *Bha. Pr – Katu Kai.Ni – Katu, Tikta* *Dha.Ni – Tikta*	*Ruksha, Ushna* *Vidahi*	*Ushna*	*Katu*
Nirgundi	*Dha.Ni – Katu, Tikta Kai.Ni - Tikta* *Ra.Ni – Katu, Tikta* *Ni.Ra – Katu, Tikta, Kashaya*	*Ruksha, Laghu*	*Ushna*	*Katu*

Pharmacological action of drugs in *Mukkamukkadukadi Gutika(8)*

The pharmacological potential of a drug is determined by a lot of factors including the phytochemical constituents, the pharmacological properties, and their indication in particular diseases in the classical texts of ayurveda. Likewise, the pharmacological potential of a formulation can be determined by assessing the pharmacological action of individual drugs on each component of the body including the *srotas, dosha, dhatu, mala*, etc.

Table 3: Pharmacological action of ingredient drugs in *Mukkamukkadukadi Gutika*

Action ▶ Drugs ▼	***Ekadosha***	***Dwidoshaja***	***Tridosha***	***Dhatu***	***Agni***	***Mala***	***Ama***
Hareetaki	*Vatahrit kaphahara*		*Tridoshagna*	*Brihmana Lekhana*	*Dipana*	*Anulomana Sramsana*	*Dipana pachana*
Amalaki		*Kaphapittagna*	*Tridoshagna*	*Vrishya dhatuvridhikara*		*Bhedana*	
Vibheetaki		*Kaphapittagna kaphavatagna*		*Raktadoshahara*		*Bhedana*	
Sunthi		*Kaphavatagna*		*Vrishya*	*agnikrit*	*Grahi Bhedana*	*Dipana pachana*
Maricha	*Kaphagna Kapha-seka*	*kaphavatagna*		*Chedi Soshana Avrishya*	*Agnikrit*		*Dipana pachana*
Pippali	*Vatagna kaphagna*	*Vatakaphagna*	*Tridoshagna*				*Dipana*
Kiratatiktha	*Kaphagna*			*Raktapittagna*			
Swetajeeraka	*Vatahara Kaphahara*			*Vrishya*		*Grahi*	*Dipana Pachana*
Krishnajeeraka	*Kaphagna*	*Kaphapittgna*		*Vrishya*	*Agnikrit*		*Pachana*
Vacha		*Kaphavatagna*		*Sukrasodhana*	*Agnikrit*		*Pachana*
Jateephala		*Kaphavatagna*		*Medahara Vrishya*		*Grahi*	*Dipana*
Kanyasara		*Vatapittahara*		*Rasasodhana*		*Bhedana*	
Saindhava			*Tridoshagna*	*Vrishya*			*Dipana*
Hingu	*Pttala*	*Kaphavatagna*			*Agnikrit*	*stambhaka*	*Pachana*
Lavanga	*Pittagna Kaphagna*	*Kaphapittagna*		*Vrishya Raktadoshahara*	*Dipana*		*Pachana*
Kushta	*Vatagna*	*Vatakaphagna*	*Tridoshagna*				
Karpura							*Pachana*
Twak	*Vatahara*	*Kaphapittagna*	*Vishagna*	*Shukrala*			*Pachana*
Kankola	*Kaphagna*	*Kaphavatagna*			*Dipana*		*pachana*
Rasona	*Vatagna*	*Kaphavatagna*		*Vrishya,balya*	*Dipana*	*Rechana*	*Pachana*
Ajamoda	*Piitagna*	*Kaphavatagna*		*Vrishya*	*Dipana*	*Vistambhi*	*Pachana*
Nirgundi	*Pittagna*	*Kaphavatagna*			*Dipana*		

Action ▶ Drugs ▼	***Srotas***	***Indriya***	***Avayava***	***Sarva shareera***	***Budhi***
Hareetaki		*Chakshusya Indriyaprasadana*	*Hridya*	*Jivana Yogavahi Balya Vayasthapana*	*Medhya Smritivardhaka*
Amalaki		*Ruchya Chakshushya*	*Keshya Varnya*	*Sarvadoshagna Vayasthapana*	*Medhya*

Vibheetaki		*Chakshushya Svadupaki*	*Keshya*		*Madakari*
Sunthi		*Ruchya Svadupaki*	*Hridya Svarya*	*vedanastapana*	
Maricha		*Ruchya*			
Pippali		*Ruchya*	*Hridya*		
Kiratatiktha				*Yogavahi Sophagna*	*Madahara Bhramagna*
Swetajeeraka	*Garbhasodhaka*	*Ruchya, Chakshushya*	*Hridya*	*Balya*	*Medhya*
Krishnajeeraka	*Garbhasodhaka*	*Ruchya*		*Durgadhagna*	
Vacha	*Vamaka*	*asyarogaghna*	*Kanthya*	*Jeevaniya*	*Medhya*
Jateephala		*Ruchya*		*Balya*	
Kanyasara					
Saindhava		*Ruchya, Chakshushya*			
Hingu		*Ruchya*	*Hridya*	*Balya*	
Lavanga	*Asyarogagna*	*Ruchya*	*Hridya*	*Vishagna*	
Kushta		*varnya*		*Rasayana*	
Karpura				*Krimigna*	*Medhya*
Twak	*Hritsodhana*	*Kanthya*	*Varnya*	*Samgrahi*	
Kankola		*Ruchya*	*Hridya*		
Rasona		*Kanthya*	*Hridya Keshya Varnya*	*Balya Rasayana*	*Medhya*
Ajamoda		*Ruchya Chakshushya*	*Hridya*		*Medhya*
Nirgundi		*Chakshushya*	*Keshya varnya*		*Medhya*

Therapeutical indication of Ingredient drugs in *Mukkamukkadukadi Gutika(9)*

Ayurveda classics have explained in detail diseases that affect different *srotas* of the body along with the symptoms and signs that can be seen on the particular disease manifestation. Even though these diseases are mostly categorized as *Nija Vyadhi* (Endogenous diseases), diseases of the *pranavaha srotas* are typical symptoms of Microbial pathogen infection which can be classified under *Agantuja vikara* (Exogeneous origin). On cross-examination and analysis of the literature available in the classics on each individual ingredient drug of *Mukkamukkadukadi Gutika*, it is clear that the drugs are efficient and indicated specifically in the diseases of *pranavaha srotas* like *swasa, kasa, jwara, hikka*, etc. Among the 22 ingredient drugs, except the drugs like Amalaki, Kiratatikta, Kustha, and Lavanga, all other drugs are indicated by acharyas in diseases caused by exogeneous factors like Krimi, Bhuta, and Jantu which in correlation with the modern science can be referred to the infectious microorganisms and pathogens.

Table 4: Therapeutic indication of drugs in *Mukkamukkadukadi Gutika with special reference to Pranavaha sroto vikara.*

Diseases ► Drugs ▼	***Swasa***	***Kasa***	***Kantharoga***	***Ajirna Ama***	***Jwara Pinasa***	***Kshaya Srama***	***Hridroga***	***Aruchi***	***Krimi Bhuta Jantu***
Hareetaki	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Amalaki	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*			
Vibheetaki	*Yes*	*Yes*			*Yes*	*Yes*	*Yes*		*Yes*
Sunthi	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
Maricha	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
Pippali	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Kiratatiktha			*Yes*		*Yes*			*Yes*	
Swetajeeraka				*Yes*	*Yes*		*Yes*		*Yes*
Krishnajeeraka				*Yes*	*Yes*		*Yes*		*Yes*
Vacha	*Yes*			*Yes*	*Yes*		*Yes*		*Yes*
Jateephala	*Yes*	*Yes*	*Yes*	*Yes*			*Yes*	*Yes*	*Yes*
Kanyasara						*Yes*	*Yes*		*Yes*
Saindhava			*Yes*	*Yes*			*Yes*	*Yes*	*Yes*
Hingu	*Yes*	*Yes*		*Yes*			*Yes*	*Yes*	*Yes*
Lavanga	*Yes*	*Yes*	*Yes*	*Yes*		*Yes*	*Yes*		
Kushta	*Yes*	*Yes*			*Yes*				
Karpura	*Yes*	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*		*Yes*
Twak		*Yes*	*Yes*		*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Kankola	*Yes*	*Yes*		*Yes*	*Yes*		*Yes*		*Yes*
Rasona	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*		*Yes*	*Yes*	*Yes*
Ajamoda	*Yes*	*Yes*		*Yes*			*Yes*	*Yes*	*Yes*
Nirgundi	*Yes*	*Yes*			*Yes*				*Yes*

Pharmacological evaluation of Drugs of *Mukkamukkadukadi Gutika*

The pharmacological action of a compound formulation will always reflect the pharmacological action of the ingredient drugs added up. Hence to make sure whether a compound formulation will show desired effect or activity against a particular condition can be assessed by understanding the proven pharmacological activity exhibited by its ingredient drugs. This further helps the ayurvedic physician to expand the possibility of using the formulation in newer disease conditions based on the pharmacological activity of its ingredient drugs. In this regard, only activities that prove the antimicrobial property of the drug, Antipyretic, Antioxidant, and immunomodulatory activities are considered in accordance with the main symptoms and signs manifested in the case of an infectious disease.

Pharmacological activity ► Drugs ▼	***Anti-Viral***	***Anti-bacterial***	***Antioxidant***	***Immuno-modulatory***	***Antipyretic***	***Cardio-protective***	***Anti-Tubercular***
Hareetaki	*Yes (10)*	*Yes (11)*	*Yes (12)*	*Yes (14)*	*Yes (13)*	*Yes (15)*	
Amalaki		*Yes (16)*	*Yes (17)*	*Yes (18)*	*Yes (19)*	*Yes (20)*	

Vibheetaki	*Yes (21)*	*Yes (22)*	*Yes (23)*	*Yes (24)*	*Yes (25)*	*Yes (26)*	
Sunthi	*Yes (27)*	*Yes (28)*	*Yes (29)*	*Yes (30)*			
Maricha	*Yes (31)*	*Yes (32)*	*Yes (33)*	*Yes (34)*	*Yes (35)*		
Pippali	*Yes (36)*	*Yes (37)*	*Yes (38)*	*Yes (40)*	*Yes (41)*		*Yes (42)*
Kiratatiktha	*Yes (43)*	*Yes (44)*	*Yes (45)*	*Yes (46)*	*Yes (47)*		
Swetajeeraka	*Yes (48)*	*Yes (49)*	*Yes (50)*	*Yes (51)*			
Krishnajeeraka	*Yes (52)*	*Yes (53)*	*Yes (54)*	*Yes (55)*			
Vacha	*Yes (56)*	*Yes (57)*	*Yes (58)*	*Yes (59)*		*Yes (60)*	*Yes (61)*
Jateephala	*Yes (62)*	*Yes (63)*	*Yes (64)*	*Yes (65)*	*Yes (66)*		
Kanyasara	*Yes (67)*	*Yes (68)*	*Yes (69)*	*Yes (70)*			
Hingu	*Yes (71)*	*Yes (72)*	*Yes (73)*				
Lavanga	*Yes (74)*	*Yes (75)*	*Yes (76)*		*Yes (77)*		
Kushta	*Yes (78)*	*Yes (79)*	*Yes (80)*				
Karpura	*Yes (81)*	*Yes (82)*	*Yes (84)*	*Yes (83)*			
Twak	*Yes (85)*	*Yes (86)*	*Yes (87)*				
Kankola	*Yes (88)*	*Yes (89)*	*Yes (90)*		*Yes (91)*		
Rasona	*Yes (92)*	*Yes (93)*	*Yes (94)*	*Yes (95)*		*Yes (96)*	
Ajamoda	*Yes (97)*		*Yes (98)*			*Yes (99)*	
Nirgundi	*Yes (100)*	*Yes (101)*	*Yes (102)*	*Yes (103)*	*Yes (104)*	*Yes (105)*	

BENEFITS OF *MUKKAMUKKUDUKADI GUTIKA* IN DISEASES OF *PRANAVAHA SROTAS* WITH SPECIAL EMPHASIS ON INFECTIOUS RESPIRATORY DISEASES CAUSED BY AIRBORNE PATHOGENS.

Based on the causative factors responsible for the onset of a disease, the signs, symptoms, severity, as well as treatment protocol of the disease, differ. Infectious diseases make their way into the human body via different routes of transmission, and among the infectious pathogens that affect the *pranavaha stotas* or the respiratory system mainly caused by pathogens that are transmitted through the air by means of direct contact, air droplets, saliva, inhalation of contaminated air, Usage of cloths and napkins soiled with mucous secretions from the upper respiratory tract. Recent decades have witnessed an increased prevalence of air borne pathogen-induced infectious diseases like Covid-19 caused by the corona virus. Since the route of entry of the virus is such infectious disease conditions is through the nasal route, the disease in such conditions mainly manifests in the form of upper respiratory tract infections with the incubation period ranging up to 15-20 days depending upon the causative pathogen. *Acharya Charaka* has basically included the pandemic infectious diseases under the concept of *Janapadodhwamsa* and the *karana* or the cause being *agantuja*. The vitiating *nidana* factors basically attack *agni* and result in *Ama* formation, further leading to *vikruta rasotpatti* and simultaneously leading to *Doshaprakopa* accompanied by *Ojokshaya (106).* In such respiratory tract infections and infectious diseases, *srotodusti* mainly happens within *rasavaha* and *pranavaha srotas*, and *srotodusti* can be witnessed in the form of *sanga and vimargagamana* which causes the *urdhwagamana* of vayu and makes the *vikruta dosha* to accumulate in areas of *Urah, Kantha* leading to the symptoms like *kasa, swasa, pinasa*, etc. This emphasizes the involvement of the Immune system also in such infectious diseases, where the immune response is either

delayed or avoided by the causative pathogen through various mechanisms and subsequently increasing the total virus load within the body and compromising the immune status of the body (107).

The formulation *Mukkamukkadukadi Gutika* is a classical formulation mentioned in the text *Sahadrayogam* mainly indicated for Abhinyasa jwara, sannipata jwara, swasa, kasa which are the predominant symptoms that can be seen in the case of respiratory tract infections, as well as diseases, caused due to infectious pathogens. Looking at the pharmacological properties and actions of the ingredient drugs of the formulation, it is seen that the majority of the drugs possess *Deepana pachana* property which is essential to resist the formation of *ama*. On analysis of the pharmacological properties of the individual drugs, all the ingredient drugs in the formulation are *katu* and *tikta rasa pradhana* and *Laghu, Teekshna, and ushna guna pradhaana.* The predominance of *Katu* and *tikta rasa* along with the *laghu, teekshna*, and *ushna guna* reduces the production of mucous in the lungs and thereby dyspnea due to alveolar occlusion. On analysis of the pharmacological action of the drugs, all the ingredient drugs are *kaphavatahara* in action and are *hridya* in nature. On analysis of the therapeutic indication of the drugs, all the ingredient drugs are indicated in the diseases like swasa, kasa, Kantharoga, and jwara, in addition to the nija rogas, the drugs are particularly indicated in *krimi roga* which can be corelated to microbial infections of the body. Pharmacological property analysis of the ingredient drugs lays the effectiveness of the formulation in cases of infectious diseases associated with fever and symptoms mainly localized to the respiratory tract. The majority of the drugs are antiviral and antibacterial in nature and most of the drugs have exhibited antipyretic activity also. The Immunomodulatory activity seen in the drugs also helps in preventing the delay and resistance of the pathogens against the immune response thereby reducing the increase of viral load within the body.

Considering the above-stated and established facts, it can be concluded that the formulation *Mukkamukkadukadi Gutika* is an important and extremely effective medicinal remedy against infectious diseases caused due to airborne pathogens as well as in the elimination of comorbid states related to the cardiovascular, metabolic, and Gastrointestinal system. It has been established through the detailed study that the medication *Mukkamukkadukadi Gutika* can be used for treatment as well as a prophylactic measure.

CONCLUSION

Mukkamukkadukadi Gutika is a well-known and well-used formulation mentioned in the text *Sahasrayogam* specifically indicated in conditions like *abhinyasa jwara, sannipataja jwara, swasa, kasa* etc. Detailed analysis of the pharmacological actions, properties, and activities of the ingredient drugs in the formulation suggests its usage in the vitiation of various systems and *srotas* like *pranavaha, rasavaha, raktavaha, annavaha srotas*, etc. Demonstrated pharmacological activities of the ingredient drugs substantiate the inclusion of the medicine as an effective remedial measure against viral infectious diseases and a potent prophylactic medicine.

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