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Covid-19 and Functional Food-Exploring Ayurvedic Knowledge on Food Habits and Dietary Preparations in Human Health w.s.r to *pathya kalpana* (Wholesome Diet) †

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Abstract: Various dietary and nutrition-related difficulties arose during the COVID-19 outbreak. Gut microbiota has been shown to play a key role in pulmonary mucosal immunity and protection against respiratory infections in studies. Diet, environment, and genetics all play a role in creating the gut microbiota, which can have an impact on immunity. The goal of discussing Pathya kalpana is to emphasise the importance of diet in maintaining physical health and treating a variety of illnesses, as well as mental health. Ayurvedic pathya kalpana,serve as functional food, promote optimal health and help to minimise illness risk, according to proponents,and these preparations are simple,effective,and economical.

Keywords: covid19; ayurvedic *pathya kalpana*; functional food; immunity; gut microbe; nutrition

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1. Introduction

The entire human race is suffering as a result of the Covid -19 epidemic. Improving the body's natural defence system (immunity) is crucial to maintaining good health. According to a recent study, as a direct effect of the pandemic, poor households are likely to shift their spending away high micronutrient content and toward less nutrient-dense foods [1]. Other research revealed a trend toward eating more processed food [2].

Recent data suggest that SARS-CoV2 affect respiratory system as well as other organs in human [3]. It reflects the human immune system's complexity in protecting against invading infections or foreign substances. Studies revealed that gut microbiota plays an important role in pulmonary mucosal immunity and protect from respiratory infections. Diet, Environmental factors and genetics play an important role in shaping the gut microbiota, which can affect immunity [4]. The nutrients that reach the gut keep gut microbiome in a state of homeostasis [5].

Currently there is no recognised food that can stop covid19.A healthy and varied diet, nutrition and dietary habits on the other hand, can help to support and regulate immune response to viral infections. Functional foods, according to proponents, promote

optimal health and help lower illness risk [6]. The purpose of discussing *Pathya kalpana* is to emphasise the importance of diet in preserving physical health and treating numerous aliments in an individual. Also focus on influence of some dietery preparations and food articles in Gut microbiota and thus helps to boost immunity. Ayurvedic *pathya kalpana* is convenient, affordable and healthy alternatives and it represents functional food as it provide a health advantage in addition to the nutrients.

2. Ayurvedic Perspective of Covid19

The traditional textbooks offer a vivid account of such epidemics under the term of '*Janapadodhwamsa'*.According to Ayurveda, *jwara* is more than just a rise in body temperature (fever), but also a sense of malaise, unease, and discomfort involving the *deha*, *indriya*, and *mana* (physical body, sensory organs, and mind).Covid -19 also be classified as being *agantu* (external)caused by *Bhoota Abhishanga* (virus), which aggravates all the three *doshas(vata,pitta,kapha).* COVID-19 can be classified as a kind of *Sannipata Jwara* due to the *agantu* and *janapadodhwamsa* nature of the disease, including fever, weariness, dry cough, aches and pains, nasal congestion, runny nose, sore throat, diarrhoea, and other symptoms [7,8]. *Jwara* is produced by the accumulation of vitiated dosha at the site of digestion, and then further difficulties with digestion and body temperature regulation [9]. As a result, such patients have less *agni* (digestive strength). If a person consumes heavy food while the doshas are disturbed and the digestive power is hindered, he will either die quickly or be miserable for a long period [10]. *Ama* is an Ayurvedic concept that can be best described as the buildup of hazardous metabolic by-products at various levels of physiology. The concept of free radicals is also linked to *Ama*. Simply said, *ama* is a by-product of poor digestion, and *ama* is one of the key reasons in all ailments, according to Ayurveda. The state of *Ama* refers to gut health, which has recently gained attention in both health and sickness [11].

3. Role of Gut Microbiota in Immunity

Early research on GF(germ free) animals revealed that the absence of commensal microbes is linked to significant gut lymphoid tissue architecture and immune function abnormalities [12]. Different bacterial species found in gut flora have been shown to drive immune system cytokine production in different ways; for example, Bacteroides fragilis and some Clostridia species appear to drive an anti-inflammatory response, whereas some segmented filamentous bacteria appear to drive inflammatory cytokine production [13]. The immune system's production of antibodies can also be influenced by gut flora. One of the functions of this regulation is to cause class switching of B cells to IgA. In most situations, B cells require T helper cell activation to switch classes; however, gut flora trigger NF-kB signalling in intestinal epithelial cells, resulting in the secretion of additional signalling molecules. These signalling molecules interact with B cells, causing them to transition to the IgA class. These cytokines and antibodies can have an impact on tissues other than the gut, such as the lungs and other organs [14].

4. Pathyakalpana (Dietery Preparation) and Food Habits in Ayurveda-Key for Healthy Microbiota

Different dietary elements influence gut microbial composition and, as a result, immunological responses in the body. According to the *Susrutha Samhita*, *Ahaara* is the source of all energy, bestows complexion, (*Varna*) stamina (*bala*), and immunity (*ojus*). When consumed in accordance with the rules and and regulations, it generates, builds, and maintains health; when not, it destroys, resulting in illness.

The following are some classic Ayurvedic food preparations known as *pathya*, which means "wholesome and calming to the body". These preparations are appetising, simple to digest, they help to rehydrate the body. It also improves and maintains *Agni*(digestive fire) and aids in both healthy and diseased states.

Formulations Prepared from Rice in pathya kalpana

- ***Manda, peya, yavagu, vilepi***

These formulations are prepared by using rice and water. Properly washed rice has to be boiled over moderate fire until the rice get completely. Table 1 shows how it is categorized.

Table 1. formulations prepard from rice.

Name of the Preparation (Rice:Water)	The Final Composition of the Produced Formulation	Properties of the Preparation
Manda (1:14)	Only supernatant liquid part is taken leaving the boiled rice	Digestive, carminative
Peya (1:14)	Equal solid rice part and liquid portion are taken.	Nourishes tissue, stop diarrhea, quickly digestible.
Yavagu (1:4)	More solid rice and less liquid part taken together	Nourishing, strengthening
Vilepi (1:4)	Only solid rice part is taken	Nourishing,diuretic,strengthening, good for heart, delicious

- ***Yava* (barley, *Hordeum vulgare*) *manda***: Prepared with one part of broken, dehusked and fried *yava (*barley) added with 14 parts of water and boiled until the barley are appropriately cooked. Later supernatant water is decanted and taken.

  Properties: it is useful in diseases of throat.
- ***Laaja* (Parched rice):** Prepared with one part of *laaja* (parched rice) along with 14 parts of water. Cooked until the rice particle is properly cooked. Later the liquid part is taken as *laaja manda*. Properties: useful in thirst, fever.

In classics, a variety of gruels prepared with different drugs for the relief of various diseases are mentioned.

- *Pippali* (*Piper longum*), *Pippali Mula*, *Chavya* (*piper retrofractum*), *Citraka* (*Plumbago indica*), and *Nagara* (dry ginger, *Zingiber officinale*) in *Yavagu* improves digestion and relieves colic discomfort.
- Gruel prepared with *gokshura* (*Tribulus terestris*), *Kantakari* (*Solanum xantocarpum*), with *Phanita* (sugarcane preparation) relieves dysuria.
- Gruel prepared with *Shaliparni* (*Desmodium gangeticum*), *Bala* (*Sida cordifolia*), *Bilva* (*Aegele marmelos*), *daadima* (pomegranate) is useful in dysentery.

- ***Yusha kalpana* (soup)**

Yusha It is a semisolid preparation made by boiling one part *dhaanya* (pulse like *Kulattha* (horse gram), *Yava* (barley), *Mudga* (green gram) with one-eight quantity of *Sunthi* (dry ginger), *Pippali* (*Piper longum*), and 16 parts water.

Properties: appetizer, laxative, Aphrodisiac, Strengthening, Provide good complexion.

- ***Krishara/khichadi***

To make *khichadi*, you can use equal amounts of *tandula* (raw rice) and *simbi dhaanya (*pulse), in1:1/2 ratio, or 1:1/4 ratio, depending on your needs. The preparation includes a small amount of *sneha* (oils), saindhava *lavana* (rock salt), *ardraka* (*ginger*), *hingu* (asafoetida), and *haridra* (curcumin). To get a solid consistency, the mixture is boiled in a pot with six parts water.

Properties: Provide energy.

- ***Takra kalpana* (butter milk)**

Takra (buttermilk) is a liquid preparation prepared by churning the curd for three hour with different ratios of water.

Properties: best digestive stimulator, used in fever, diarrhoea, anaemia etc.

- ***Visyandana***

Raw wheat flour is cooked with an equal amount of ghee and milk until it reaches a consistency that is neither solid nor liquid.

Properties: *Balavardhaka* (increases strength).

- ***Rasala***

To make this, combine the curd with the appropriate amount of sugar, chilli, ghee, and honey. This is well churned and a small amount of *karpura* (camphor) is added for a pleasant odour. Properties: improves the taste sensation, nourishing, strengthening.

- ***Maamsa rasa* (Meat soup)**

A soup prepared by boiling chopped meat with required quantity of water. Two, four, six or eight times of water are added considering the nature of meat with the chopped meat and boiled over moderate fire to get it in desired consistency.

Properties: improve strength, useful in persons who are emaciated, weak after a chronic illness.

5. Scientific Evidences

5.1. Kulatha (Horse Gram, Macrotyloma uniflorum Lam.)

Horse gramme is high in carbs (51.9–60.9%), Starch, nonstarch polysaccharides (dietary fibre), and a large number of oligosaccharides are particularly abundant.protein (17.9%–25.3%), essential amino acids, energy, iron, molybdenum, phosphorus, iron, and vitamins such as carotene, thiamine, riboflavin, niacin, and vitamin C. Through fermentative mechanisms, GM converts these complex carbs into butyrate (SCFAs) in the large intestine. Butyrate and other bioactive compounds defend against inflammatory reactions, which are a risk factor for gut dysbiosis. Bowman–Birk inhibitor (BBI), a proteinase inhibitor found in horse gram, may have anti-inflammatory properties in the treatment of a variety of degenerative and autoimmune diseases [15].

5.2. Takra (Buttermilk) as a Source of Probiotics

Buttermilk may potentially be used as a glycotoxins inhibitor, according to new research findings. When the generation rate of glycotoxins does not meet the rate of elimination, metabolic problems occur. buttermilk acts as an oxidative stress remover.probiotic strengthen the immune sysytem by increasing the formation of secretory IgA. SIgA is the most common immunoglobulin on the surface of mammalian mucous membranes, and it aids in particular immunity against harmful bacteria [16].

5.3. Yava (Barley, Hordeum vulgare)

Barley and oats are the main sources of β-glucans. Prebiotic characteristics of β -glucans have been confirmed by a rise in colonic microbial population and activity, with a preference for Lactobacillus and Bacteroidetes spp., as well as an increase in SCFAs. Phytonutrients particularly phenolic acid present in whole grains have low absorption in the small intestine and thus make them available for the uptake by colonic microbiota. these phenolic metabolites exhibit antioxidant and anti-inflammatory effects. as well as in the gut and other tissue,it interfere with cell communication and gene regulation [17].

5.4. Aardraka (Ginger,Zingiber officinale)

Gingerols and shogaols present inginger are quickly absorbed in the small intestine and have been found to be digested by human gut bacteria. Ginger supplementation

changed the configuration of the gut microbiota, increasing Bifidobacterium species and SCFA-producing bacteria (Alloprevotella and Allobaculum). Studies have shown that the active ingredient in ginger, gingerols, has the ability to turn off inflammatory genes and suppress the function of leukotrienes (inflammatory molecule) [18].

5.5. Mudga (Vigina radiata)

Green gram, in addition to being a healthy food, has possible health benefits such as antioxidant, anti-cancer, anti-inflammatory, and hypolipidemic properties. It contains a significant amount of galactooligosaccharides, which promote the growth of healthy intestinal bacteria. Green gram is high in proteins, carbohydrates, dietary fibre, vitamins, and minerals [19].

6. Discussion

Rasa (Taste perception), *Guna* (Properties),*Virya* (Potency), *Vipaka* (Postdigestive effect), and *Prabhava*(special effect) are some of the principles of Ayurveda related to drug and food pharmacodynamics and pharmacokinetics. The action of a drug/food is exhibited either by its *Rasa, Guna, Vipaka, Virya*, or *Prabhava*. ' In ayurveda, it is mentioned that "*samskaro hi gunantaradhanam uchyate*", *samskara/kalpana*(proceesing) aims to impart additional properties to the substance.Thus the *pathya kalpana* helps to stimulate *Agni*(digestive fire) helps in *Amapchana*, refers to the removal of toxins and the restoration of gut health.

7. Conclusions

Providing right gut environment with right diet can help to establish the right microbiome, which can have significant metabolic benefits and help to boost immunity and help to prevent infections.ayurvedic *pathyakalpana* is a good choice of dietery preparation in current pandamic situation.it may have significant role in providing nutrition,food satisfaction and health benefits in various ailments in quick and affordable way.

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