



Review Article

A COMPREHENSIVE STUDY ON AYURVEDIC DIETARY PRINCIPLES (AHARA) & MENTAL HEALTH IN MODULATING GUT-BRAIN MICROBIOTA AXIS IN GASTROINTESTINAL, PSYCHIATRIC AND NEUROLOGICAL DISORDERS

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Article info

Article History:

Received: 15-04-2026

Accepted: 11-05-2026

Published: 08-07-2026

KEYWORDS:

Ahara, Agni, Ama, Gastrointestinal disorders, Grahani, Gut-Brain-MicrobiotaAxis, Neurological disorders, Trigunatmak Ahara.

ABSTRACT

Food (*Ahara*) is considered one of the three pillars or *Thrayopasthambha* of life in Ayurveda. Classical texts state that the mind is nourished by food. Modern science describes the Gut-Brain Axis as a bidirectional communication system between the gastrointestinal tract and the brain which is mainly influenced by gut microbiota. Disturbance in dietary habits leads to weak digestion (*Agnimandya*) and formation of *Ama*, which affects both physical and mental health. This article aims to explore the role of Ayurvedic dietary principles in maintaining mental health through the concept of the Microbiota-Gut-Brain Axis. A conceptual and narrative review was conducted using classical Ayurvedic texts, *Bhagavad Gita* and modern scientific literature. The findings reveal that improper diet, *Viruddhahara*, irregular eating habits, and unhealthy food processing (*Samskara*) disturb gut microbiota and digestion, leading to psychiatric disorders such as anxiety, depression, neurodevelopmental disorder like autism spectrum disorders, neurodegenerative conditions like parkinsonism and gastrointestinal disorders like irritable bowel syndrome. Following *Ahara Vidhi Vidhanam*, proper *Ahara Matra* and *Ahara Kala*, and diet balanced with *Shadrasa* and *Triguna* etc., help in maintaining gut health and mental health. Ayurvedic dietary principles can be effectively integrated with conventional treatment modalities for the prevention and management of gastrointestinal and psychiatric and neurological disorders.

INTRODUCTION

Ayurveda considers *Ahara* (food) as one of the three fundamental supports of life (*Trayopasthambha*) along with *Nidra* (sleep) and *Brahmacharya* (celibacy)^[1]. Classical literature emphasizes that proper diet is essential for both physical and mental well-being. The *Chandogya Upanishad* states, “*Annamayam hi somya manah*”^[2], meaning that the mind is nourished by food. As *Acharya Arunadatta* has stated. The body and the mind influence each other continuously, just like cold ghee kept in hot pot also becomes hot and vice versa.^[3]

Modern science also explains the interaction between the digestive system and the brain through the concept of the Gut-Brain -Microbiota Axis. It is a bidirectional communication network includes CNS, ANS, ENS and HPA axis.^[4] This axis involves neural, hormonal, immune, and metabolic pathways and is strongly influenced by gut microbiota.^[5]

Gut microbiota influence brain function by producing neurotransmitters, hormones, and metabolic substances. At the same time, psychological stress and emotional states affect gut motility, secretion, and microbial balance. This interaction plays an important role in several clinical conditions such as, anxiety^[6] depression^[7], autism spectrum disorder (associated with dysbiosis)^[8], gastrointestinal disorders like irritable bowel syndrome (IBS)^[9] and chronic neurodegenerative conditions like Parkinsons disease^[10] where stress is a major factor.

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<https://doi.org/10.47070/ayushdhara.v13i3.2684>

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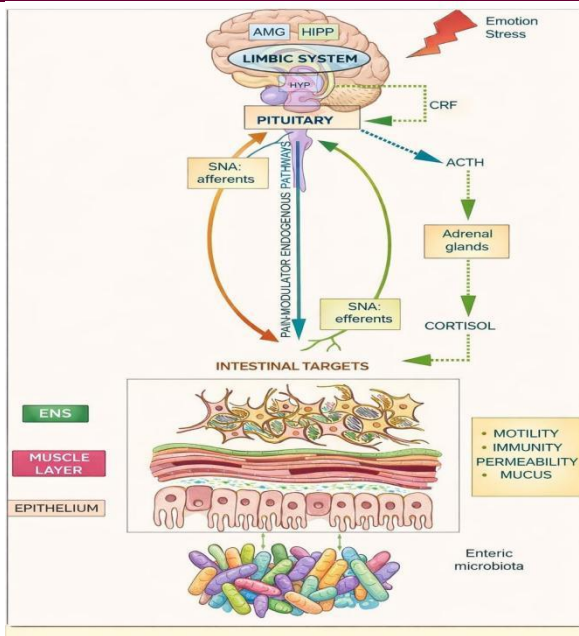


Fig 1: Gut brain microbiota axis^[11]

Gut microbiota influence brain function by producing neurotransmitters, hormones and metabolic substances. At the same time, psychological stress and emotional states affect gut motility, secretion, and microbial balance. This interaction plays an important role in several clinical conditions such as autism spectrum disorder (associated with dysbiosis), anxiety and depressive behaviors, gastrointestinal disorders, and irritable bowel syndrome (IBS), where stress is a major etiological factor. Adolescent pre-and probiotic supplementation may enhance resilience to neurodegenerative disorders by modulating biomolecules that reduce inflammation, support neurogenesis and suppress production of proinflammatory cytokines (TNF, interleukins).^[12]

Serotonin plays a crucial role as a neurotransmitter that regulates mood, body temperature, pain reception, food intake and appetite, circadian rhythm, sexuality, memory and stress response. Numerous bacteria like *Streptococcus*, *Lactobacillus*, *Klebsiella* and *E.coli* have expressed serotonin synthesizing properties via tryptophan synthetase mediation. Thus 90% of serotonin is produced in intestine. Also, evidence on the effect of the gut microbiome on tryptophan metabolism is established by research on animal models depleted of gut microbiome. It is clear that tryptophan and serotonin are centrally integrated in the pathogenesis of many neurological and psychiatric disorders such as depression and anxiety.^[13]

Various intestinal microbes participate in the synthesis of neurotransmitters, including glutamate, serotonin, noradrenaline, dopamine, and γ -aminobutyric acid (GABA), influencing their function and bioavailability in both the central nervous system

(CNS) and peripheral tissues. Alterations in these neurotransmitters such as reduced dopamine levels have been associated with the pathogenesis of neurodegenerative disorders. Also, Gut microbiota significantly regulates dopamine bioavailability in the enteric and central nervous systems.^[14]

Some gut microorganisms have neuroprotective effect on dopaminergic neurones, slowing dopamine depletion and some have detrimental impact by activating inflammatory responses via endotoxins further depleting dopamine quantities.^[15]

Ayurveda had already described this relationship through concepts such as *Agni* (digestive fire), *Grahani* (site of *Agni*), *Rasa Dhatu*, *Ojas*, and *Mana* (mind). This article aims to explore all these concepts and contemporary dietary practices or modern food processing methods (*Samskara*) which can be considered as *Anukta*^[16] and how these influences *Agni* and leads to *Ama* formation, which affects the mind and causes gastrointestinal, psychiatric and neurological disorders.

MATERIALS AND METHODS

This study is a conceptual, descriptive, and narrative review. Classical Ayurveda texts such as *Charaka Samhita*, *Ashtanga Hridaya*, and other relevant literatures such as *Bhagavat Gita* were reviewed. Modern scientific articles related to Gut-Brain -Microbiota Axis were also analyzed.

Relevant information was collected, interpreted, and correlated with Ayurvedic principles of *Agni*, *Ama*, *Grahani*, *Rasa dhatu*, *Mana*, *Shadrasa* and *Triguna*.

Review of literature

Concept of Digestion and Mental Health in Ayurveda

According to Ayurveda, health depends on proper digestion and metabolism governed by *Jatharagni*. When this functions normally, food is digested and converted into *Rasa Dhatu*, which nourishes all tissues under the influence of *Dhatvagni* and supports mental well being.

Improper dietary practices includes:

- Eating in excess or insufficient quantity (*Atimatra / Hinamatra*).
- Irregular eating habits (*Samasanam /Adhyasanam/ Vishamasanam-Akala bhojana, Bahu bhojana and Alpa bhojana*).^[17]
- Consumption of incompatible foods (*Viruddhahara*)
- Eating during emotional disturbances such as sorrow, anger, and ravenous hunger (*Upataptha mana, Krodha-soka-Kshut*).^[18]
- Unhealthy food processing (*Samskara*).^[19]

• *Malinahara*^[20]

Eating in *Heena matra* is not capable for promoting *Bala*, *Upachaya*, *Ojus* and it is a major causative factor for all types of *Vata rogas*.^[21] At the same time eating in *Atimatra* causes *Tridosha kopa*.^[22]

All these leads to *Agnimandya* and *Ama* formation^[23]. *Ama* obstructs body channels (*Srotas*),

causes formation of *Dushta Rasa Dhatu*, reduces *Ojas*, and weakens mental strength since *Tushti (Mana Praharsha)*^[24] is the *Karma* of *Rasadhatu*. This results in gastrointestinal and psychiatric conditions.

Role of Ahara Vidhi Vidhanam in digestion

Charaka Samhita describes specific rules for proper food intake known as *Ahara Vidhi Vidhanam* ^[25].

Table 1: Principles of eating or Ahara Vidhi vidhana and its effect on digestion

No.	Principle of Eating (Ahara Vidhi Vishesha)	Effect on Digestion (Agni & Ama)
1.	Food should be warm (<i>Ushna</i>)	Stimulates <i>Agni</i> , <i>Vatanulomana</i> , quick digestion.
2.	Food should be unctuous (<i>Snigdha</i>)	Supports <i>Agni</i> and improves <i>Bala</i> and <i>Varna</i> .
3.	Food should be taken in proper quantity (<i>Matrvat</i>).	Prevents <i>Agnimandya</i> and <i>Ama</i> , easy digestion.
4.	Eat only after previous meal is digested (<i>Jeerna</i>).	<i>Ahara rasa</i> of current meal gets mixed up with immature <i>Ahara rasa</i> of previous meal leading to <i>Rasa dusthi</i> . It causes morbidity of all <i>Doshas (Tridosha kopa)</i> .
5.	Food should not be incompatible in the aspect of <i>Veerya (Veerya Avirudha)</i> .	Prevents diseases like <i>Kushta</i> , <i>Visarpa</i> etc.
6.	Eat in a pleasing place (<i>Ishta Deshe</i>).	Otherwise, it will cause mental disturbance and thus affects digestion (<i>Mano vighata</i>).
7.	Eat equipped with all the accessories (<i>Ishta Sarvopakarane</i>)	Otherwise, it will cause mental disturbance and thus affects digestion (<i>Mano vighata</i>)
8.	Not too fast (<i>Na Atidrutam</i>)	It can enter into wrong passage
9.	Not too slow (<i>Na Ativilambita</i>)	Won't give satisfaction, hence Over eating, food would become cold, Improper digestion (<i>Vishama Pachanam</i>)
10.	Eat with attention and without talking and laughing (<i>Ajalpan, Ahasan</i>)	Otherwise, it can enter into wrong passage
11.	Eat mindfully (<i>Tanmana Bhunjeeta</i>)	One should think, "is this food suitable for me or not" (<i>Idam mama upashete, idam na upashete</i>)

Agnidushti and Grahani

Grahani is the site where *Agni* is situated^[27]. In the context of *Grahani Chikitsa*, *Acharya Charaka* has explained that habits like fasting (*Abhojana*), indigestion (*Ajeerna*), contaminated food (*Sandushtabhojana*), suppression of natural urges (*Vegadharana*), faulty adaptation of place, time and season (*Desha-Kala-Ritu Vaishamya*), food that is not habituated (*Asatmya Ahara*) etc., result in *Agnidushti*. This result in *Shuktatwa* of uncooked *Ahara* and it becomes *Visha*.^[27]

Etiology of Ama

In Ayurveda, *Ama* is defined as the toxic, undigested, and unprocessed form of food (*Ahara rasa*) resulting from impaired digestive fire (*Agnimandya*). It is considered the root cause of many diseases^[28]. *Acharya Charaka* explain that *Ama* is not produced merely by excessive quantity (*Atimatra*) of food but also due to faulty food quality, incompatible

combinations, improper processing methods, and disturbed mental states during eating.^[29]

According to *Ashtanga Hridaya*, consumption of abhorrent (*Dvishta*), charred (*Dagdha*), under cooked (*Ama*), that causes burning sensation (*Vidahi*), excessively water soaked (*Athyambupluta*) heavy (*Guru*), dry (*Ruksha*), cold (*Sheeta*), dried (*Shushka*), incompatible (*Viruddha*), and unclean (*Ashuchi*) food leads to improper digestion and *Ama* formation. Similarly, intake of food during emotional disturbances (*Upathapthana Bhukta*) such as anger (*Krodha*), grief (*Soka*) and hunger (*Kshut*) further impairs digestion and produces *Ama*.^[30]

Irregular eating habits includes *samashana* (mixing of both *Pathya* and *Apathya* meals), *Adhyashana* (eating before previous meal is digested), and *Vishamashana*^[31] which includes untimely food intake (*Akala bhojana*), Excessive eating (*Bahu bhojana*) and eating in less quantity (*Alpa bhojana*).

Vagbhata explained all these along with causative factors for *Ama*.^[32] The *Ama* formed in this way can be considered as *Visha*.^[33]

Similarly, *Vagbhata* has said that *Virudhahara* is also equivalent to *Visha* or *Garavisha*.^[34]

Pathogenesis (*Samprapti*) of *Ama* and its Effect on Mind

All the improper dietary practices mentioned above lead to weakening of *Agni* and improper digestion of food. This results in the formation of *Ama*, which blocks the body channels (*Srotas*) and disturbs *Rasa Dhatu*.

When *Agni* is impaired, it affects lifespan (*Ayu*), complexion (*Varna*), strength (*Bala*), general health (*Swasthya*), energy (*Utsaha*), metabolism (*Upachaya*), vitality (*Ojas*) etc.^[35]

Due to *Rasa Dushti*, nourishment of all *Dhatus* as well as *Ojus* which can be either defined as the substantial essence of all *Dhatus*^[36] or *Mala* of

Sukradhatu^[37] is affected, leading to symptoms such as phobias, excessive thoughts (*Abheekshnam Dhyayati*) etc.^[38] and finally affects mind^[39] (*Tushti-Mana Praharsha*).

In *Ashtanga Sangraha* it is mentioned that along with somatic diseases like *Visphota*, *Gulma* etc, *Virudhahara* causes impairment of cognitive functions like memory (*Smriti*), intellect (*Mati*), sense organs (*Indriya*) and mind (*Chitta*).^[40]

In addition, since *Agni* is mainly located in *Grahani* it is then affected by *Ama* ^[41]. Impaired *Agni* may be considered a significant contributing factor in Autism Spectrum Disorder (ASD), reflecting underlying alterations in gut microbiota ^[42]. There is a possible association between microbial dysbiosis and neurodevelopmental disturbances ^[43].

Role of *Triguna* in Mental Health

Following table defines how each *Guna* influences mental qualities and behavioural tendencies.

Table 3

<i>Triguna</i>	Features ^[44]	Satvadiguna Bhava ^[45]
<i>Sattvika</i>	<i>Laghu, Prakashakam, Shantham</i>	Cleanliness (<i>Soucham-Vak, kaya, mana</i>), belief in God (<i>Asthikyam</i>), righteousness (<i>Dharma</i>)
<i>Rajasa</i>	<i>Chala, Pravartaka, Ghora</i>	Talkativeness (<i>Bahubhashitwa</i>), pride (<i>Mama</i>), anger (<i>Krut</i>), vanity (<i>Dambh</i>), competition (<i>Matsarya</i>)
<i>Thamasa</i>	<i>Guru, Pramohaka, Mooda</i>	Fear (<i>Bhaya</i>), ignorance (<i>Ajnana</i>), sleep (<i>Nidra</i>), laziness (<i>Alasya</i>), grief (<i>Vishadita</i>)

Role of *Trigunatmaka Ahara* and *Shadrasa* in Mental Health

Ayurveda explains that diet should contain all six tastes (*Madhura, Amla, Lavana, Katu, Tikta, Kashaya*)^[46]. A balanced intake of *Shadrasa* maintains *Dosha* equilibrium and supports both physical and mental health.

The mental qualities of a person are governed by *Trigunas* such as *Sattva*, *Rajas*, and *Tamas*. According to *Bhagavat gita*, *Ahara* with following features can influence the *trigunas* of the person having that food.^[47]

Table 4

Predominant <i>Triguna</i>	Features	Effects
<i>Sattvika</i>	Juicy (<i>Rasya</i>), Snigdha, <i>Sthira, Hridya</i>	Duration of life (<i>Ayu</i>), mental strength (<i>Sattvabala</i>), health (<i>Arogya</i>), happiness (<i>Sukha</i>), satisfaction (<i>Preeti</i>)
<i>Rajasika</i>	<i>Katu, Amla, Lavana, Athyushna, Tikshna, Ruksha, Vidahi</i>	Distress (<i>Dukha</i>), misery (<i>Soka</i>), diseases (<i>Amaya</i>)
<i>Tamasika</i>	Food prepared three hours before being eaten (<i>Yathayama</i>), tasteless (<i>Gatarasa</i>), bad smelling (<i>Puti</i>), decomposed (<i>Paryushita</i>), remnant of food eaten by others (<i>Ucchishta</i>), impure (<i>Amedhya</i>).	Not mentioned

DISCUSSION

This review highlights a strong link between classical Ayurvedic principles of diet and digestion and the modern understanding of the Gut-Brain-Microbiota Axis.

In Ayurveda, *Dehagni* is the key factor for health or that which help to live long without diseases. This *Agni* itself provides even *Prana, Ojus* etc ^[48]. When *Agni* is balanced, it properly forms *Rasa Dhatu*, which supports *Ojas* and mental clarity (*Sattva*). This relates

to a healthy gut microbiome in modern science, where a balanced microbial composition enhances digestion, nutrient absorption, and the production of neurotransmitters and there by influencing brain function [11]. On the other hand, when *Agni* is impaired (*Agnidushti*), it leads to the formation of a *Visha* or *Garavisha*.^[30,31] This parallels the idea of microbial dysbiosis and the buildup of harmful substances like endotoxins^[14].

As stated in the *Chandogya Upanishad*, *Ahara sudhi* (purity of food) leads to *Sattva Suddhi* (clarity of

mind).^[1] Along with this by considering table 4 it is clear that food not only nourishes the body but also influences the mind through its *Rasa* (taste); each taste exerts a specific effect on the *Trigunas*, thereby impacting mental health and behaviour.

Hence the following table is derived by compiling order of *Guna* or *Veerya* of *Rasa* as per *Ashtanga hridaya* and predominant *Triguna* in each *Rasa* as per *Bhagavat Gita* (Table 4).

Table 5

<i>Guna/Virya</i>	Order of <i>Rasas</i> ^[49]	Corresponding <i>Triguna</i>
<i>Usna</i>	<i>Katu</i> < <i>Amla</i> < <i>Lavana</i>	<i>Rajasa</i>
<i>Ruksha</i>	<i>Tikta</i> < <i>Katu</i> < <i>Kashaya</i>	<i>Rajasa</i>
<i>Snigdha</i>	<i>Lavana</i> < <i>Amla</i> < <i>Madhura</i>	<i>Sattvika</i>

Apart from these in the contemporary era, it is also essential to consider the wide diversity of dietary patterns and the impact of unhealthy modern food processing methods.

Following table shows modern food items and its correlation with *Viruddhahara* or *Samskara*.

Table 6

No.	Modern Food Item (<i>Anukta</i>)	Correlation with <i>Viruddhahara</i> / <i>Samskara</i>
1	Smoothies (soaked dry fruits and seeds +fresh fruit + milk + ice)	Incompatible food combination (<i>Viruddhahara</i>) and cold processing (<i>sita</i>), excessively water soaked (<i>Atyambuplutam</i>), uncooked (<i>Ama Ahara</i>)
2	Milkshakes	Heavy (<i>Guru</i>) and cold preparation (<i>Sita</i>), <i>Virudha</i>
3	Overnight Oats	Excessively water soaked (<i>Atyambuplutam</i>)
4	Alfam, Tandoori Roti, Tandoori Chicken	Charred (<i>Dagdha</i>)
5	Fried Ice cream	Cold (<i>Sita</i>) but heated, and heavy (<i>Guru</i>) combination (<i>Veerya Viruddha</i> + <i>Samskara</i>)
6	Fast foods (pizza, burger, fries)	Highly processed (<i>Samskara</i>)
7	Instant noodles	Preserved and highly processed food (<i>Samskara</i>)
8	Frozen foods	Stored for long time and reheated (<i>Samskara</i> , <i>Sushka</i>)
9	Flavoured yogurt / sweet curd	Combination with sugar (<i>Guru</i> , <i>Snigdha</i> , <i>Sita</i>) and additives (<i>Samskara</i>)
10	Chocolates and candies	Excess sugar and chemical additives (<i>Guru</i> , <i>Snigdha</i> , <i>Samskara</i>)
11	Ready-to-eat meals	Artificially preserved and processed food (<i>Samskara</i>)
12	Packaged fruit juices	Preserved and chemically processed (<i>Samskara</i>)
13	Carbonated drinks	Artificial additives and chemical processing (<i>Samskara</i> , <i>Vata prakopa</i>)

Acharya charaka explains *Malinahara sheela* as an etiology in the context of *Atatvabhinivesha*. It leads to *Doshadushti* in *Manobudhivaha sira* and mind becomes *Avrita* by *Rajas* and *Moha* (confusion). Hence *Sodhana* and *Samsarjana* are mentioned as treatment aiming at *Koshta sudhi* and *Agni deepana*.^[50]

In Ayurveda, interventions such as *Deepana* and *Pachana*, aim to restore *Agni* and facilitate

Manovaha Srotas Shuddhi, which may support the optimal functioning of the mind and nervous system.^[51]

Hence *Vilvadi gutika* is often chose as an internal medicine in the management of ASD considering its potency to maintain healthy gut microbiota.^[52]

Recent studies show that gut microbiota affect central nervous system function through neural, endocrine, and immune pathways^[5]. Some beneficial microbes have neuroprotective effects on dopaminergic neurons and might slow dopamine depletion. In contrast, harmful bacteria release endotoxins, causing systemic inflammation and playing a role in neurodegeneration.^[15] So promoting beneficial microbes and reducing harmful microbes is the key to maintain proper gut health. This dual role of microbiota aligns with the Ayurvedic concept of curing *Ama vikaras* by *Langhana*, *Langhana-Pachana*, *Sodhana*^[53] and *Peyadi krama*^[54] following *Shodhana* which improves *Agni*. Here, *Deepana* is not mentioned because it does not cure *Ama* instead it does *Agni deepana* only^[55]. Hence for attaining proper gut health both *Deepana* and *Pachana* should be administered wisely. Use of *Takra* in conditions like *Grahani dosha*, *Pandu* etc., by considering its *Deepana karma* and *Srotosodhana*^[56] aligns with the modern researches showing the probiotic action of buttermilk^[57].

Ayurveda emphasizes the importance of mental state during meals through concepts like *Upataptha mana*, *Krodha-soka-Kshut*^[18]. Psychological stress changes gut motility, permeability, and microbial composition through the hypothalamic-pituitary-adrenal (HPA) axis. This supports the Ayurvedic view that disturbed mental states during eating hinder digestion and lead to *Ama* formation, resulting in gastrointestinal and psychological or psychiatric conditions.

The classification of food by *Triguna (Sattva, Rajas, Tamas)* provides a unique perspective. *Sattvika* foods are fresh, light, and nourishing, which may encourage a healthy microbiota and stable neurotransmitter levels. *Rajasika* and *Tamasika* foods on other hand can disrupt microbial balance and promote inflammation. Modern diets with processed foods, artificial additives, and conflicting combinations (as per table No: 2) can be considered under the concept of *Samskara* and it is seen as contributors to dysbiosis and metabolic endotoxemia. This aligns with the principle of *Viruddhahara* and *Visha* formation.

Additionally, the discussion on serotonin synthesis is crucial. About 90% of serotonin is produced in the gut, regulated by microbial metabolism of tryptophan. Bacteria like *Lactobacillus* and *Streptococcus* are involved in this process, affecting mood, cognition, and stress response.^[13] This supports the Ayurvedic notion that proper digestion and *Rasa Dhatu* formation are vital for emotional satisfaction (*Tushti*)^[24] and stability.

The pathogenesis described in Ayurveda beginning from *Agnimandya* to *Ama* formation to

Srotorodha to *Grahani Dushti* to *Rasa Dushti* to *Ojas Kshaya* to *Manovaha srotodushti* can be viewed in modern terms as dysbiosis leading to inflammation, altered neurotransmission, and mental health disorders. Conditions like irritable bowel syndrome, anxiety, depression, and autism spectrum disorders illustrate this gut-brain connection associated with dysbiosis.

While the practices like mindful eating (*Tanmana Bhunjeeta*), eating in pleasant space (*Ishta Deshe*) with all equipments (*Ishta Sarvopakarane*) needed mentioned in *Ahara vidhi vidhana* acts on "Brain to Gut axis", other principles like *Deepana*, *Pachana*, *Sodhana*, *Peyadi* helps in correcting "Gut to Brain axis".

CONCLUSION

Ayurvedic dietary principles play a vital role in maintaining mental health by supporting digestion and healthy gut microbiota. Proper food quantity, quality, and timing prevent *Agnimandya* and *Ama* formation.

Avoidance of incompatible foods, irregular eating habits, and unhealthy food processing helps maintain gut and mental health. Ayurvedic dietary guidelines can be effectively applied in the prevention and management of leading to psychiatric disorders such as anxiety, depression, neurodevelopmental disorder like Autism Spectrum Disorder, neurodegenerative conditions like Parkinsonism and gastro intestinal disorders like irritable bowel syndrome.

Modern understanding of the Microbiota-Gut-Brain Axis strongly supports the classical Ayurvedic concept of the relationship between food, digestion, and the mind. Recognizing the links between *Agnidushti*, *Ama* and dysbiosis, *Agni* and metabolic efficiency and mental health can lead to new ways of holistic and integrated approaches to manage gastrointestinal psychiatric and neurological conditions.

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Cite this article as:

Vishnupriya Thankachan, Sunilkumar. A Comprehensive Study on Ayurvedic Dietary Principles (Ahara) & Mental Health in Modulating Gut-Brain-Microbiota Axis in Gastrointestinal, Psychiatric and Neurological Disorders. AYUSHDHARA, 2026;13(3):389-397.

<https://doi.org/10.47070/ayushdhara.v13i3.2684>

Source of support: Nil, Conflict of interest: None Declared

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