



EFFECT OF STRESS IN THE FORMATION OF AMA W.S.R. TO GUT-BRAIN AXIS

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ABSTRACT

Ayurveda, a holistic system of medicine from ancient India, considers *Manas* (the mind) one of the fundamental components of health and disease. *Manas Bhavas* refer to emotional and psychological factors such as anger, fear, greed, grief, and other emotional trauma that can disturb the balance of *Doshas* (*Vata*, *Pitta*, and *Kapha*) and *Agni* (digestive fire) within the body. When *Agni* is weakened, partially digested food (*Ama*) accumulates, impairing cellular function and contributing to disease. Stress, a prevalent modern-day phenomenon, significantly impacts *Agni* by altering gut motility, secretion of digestive enzymes, and microbiota composition. The gut-brain axis, a bidirectional communication network between the gut and the central nervous system, is crucial in regulating stress responses and gastrointestinal functions. Chronic stress disrupts this axis, leading to dysregulation of the gut microbiota, increased intestinal permeability, and inflammation—factors known to promote *Ama* formation, according to *Ayurveda*. This abstract highlights the potential for interdisciplinary collaboration between *Ayurveda* and modern medicine to address the complex interplay of stress, gut health, and *Ama* formation. By understanding and managing stress through the lens of the gut-brain axis, healthcare providers can develop more effective preventive and therapeutic approaches tailored to individual needs, promoting overall well-being and vitality.

Keywords: *Ama*, *Manas Bhavas*, Stress, Gut-Brain Axis

INTRODUCTION

Ayurveda has its own identity as India's most ancient and traditional system of medicine. It is regarded as "the science of life," according to *Ayurveda* literature, a proper diet and its digestion through *Agni* (digestive fire) are the main components of a healthy life. This can be understood as per the description given by *Acharya Sushrut*: "Sama Dosha (balanced fundamental physiological governing principles of the body), "Samagnischa" (balanced metabolic and digestive processes), "Sama Dhatu (balanced tissue system), "Malakriya" of excretory functions), "Prasanna" (ecstasy), "Atmendriya Manah" (soul, sense organs and mind), "Swasthya Iti Abhidhiyate (called a healthy state)^[1]. An improper diet or error in the digestive process results in the production of *Ama*, a toxic material that initiates and promotes disease processes. *Ama* is an undigested or intermediate product of digestion or metabolism. It possesses the property of a toxin responsible for various local and systemic disorders^[2]. Today, stress has become an inevitable and most unwanted companion of civilisation. Stress can be defined as a state of worry or mental tension caused by a difficult situation. Stress refers to the physiological and psychological responses of the body when it encounters a demand or challenge that exceeds its ability to cope effectively. (American Psychological Association) When a person experiences stress, the body's sympathetic nervous system is activated, releasing stress hormones such as cortisol and adrenaline (epinephrine). These hormones prepare the body for a "fight-or-flight" response, which includes increased heart rate, elevated blood pressure, heightened alertness, and enhanced energy metabolism^[3]. Although stress is not properly defined in any *Ayurveda* texts, it can be linked with "*manas bhavas*," as they encompass various mental and emotional conditions that affect overall well-being and can be considered stressors. A stressor is regarded as a stimulus that threatens homeostasis^[4]. The Gut-Brain Axis (GBA) represents a dynamic and intricate communication network linking the central

nervous system (CNS) with the gastrointestinal tract (GI) and its resident microbiota. This bidirectional communication system plays a pivotal role in regulating various physiological processes, impacting not only digestive functions but also cognitive, emotional, and behavioural responses^[5]

PREVALENCE According to a Gallup survey, Mental health issues have significantly increased over time. Globally, 41% of adults report experiencing a lot of stress. One in every eight people, or 970 million people around the world, were living with a mental disorder. About one-third of people worldwide reported feeling stressed, worried, and angry. About 77 per cent of Indians displayed at least one symptom of stress, and one in every third Indian was struggling with stress and anxiety.

METHODOLOGY

This paper's content is based on *Ayurveda* classics with accessible commentaries, a textbook of contemporary medical sciences, and several articles to better comprehend the idea of *Ama*, *Manas Bhava*, stress, and the gut-brain axis.

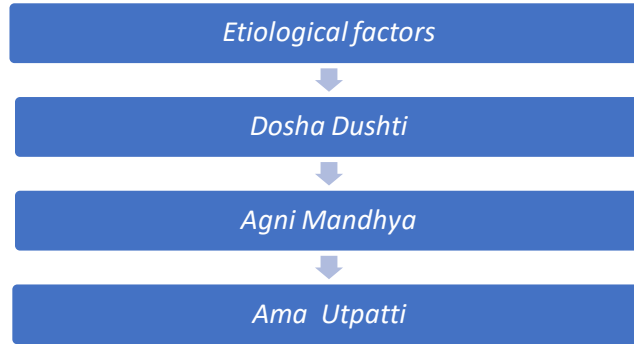
CONCEPT OF AMA

Ama is defined as a toxic, pro-inflammatory waste product that blocks the body's channels, triggers adverse immune reactions and is considered to be a primary cause of internal disease.

ऊष्मणोऽल्पबलत्वेन धातुमाद्यमपाचितम् ।
दुष्टमामाशयगतं रसमामं प्रचक्षते ॥ (अ.ह.सु 13/25)

The ingested food material undergoes a series of physical and chemical transformations before it is rendered acceptable by the body tissues. The transformation occurs through the action of a particular *Agni* on the ingested food material of a specific substance. The transformation process entirely depends on the strength of this *Agni*. If the person is suffering from *Mandagni* and is still doing *Adhyashan* or *Vishmashan*, it will lead to the formation of *ama*^[6]. The *Samprapti* of *Ama* is given in Fig. 1

Fig. 1 – Samprapti of Ama



ROLE OF MANSIK BHAVAS IN THE FORMATION OF AMA

When an individual experiences *Chinta*, *Krodha*, and *Shoka*, it can disrupt the natural balance of *Agni*. This disruption can lead to digestive problems, such as indigestion. These *Manas Bhavas* (negative emotions) affect digestion, i.e., the function of *Agni*. *Acharya Sushruta* also described that a person afflicted with jealousy, fear, anger, miserliness, grief, helplessness, and hatred, if they consume food, does not undergo digestion properly [7] *Manasika bhavas* like *Vishada*, *Shoka*, *Bhaya*, etc., cause *Prakopa of Vata*, which mainly leads to the vitiation of *Prana Vayu*. Being soaked up in *Murdha* (brain), from where it executes its work, it features a coordinated relationship with the *Manasika bhava*. *Prana Vayu* is the

physiological controller of all other forms of *Vata*. So, *Prakopa* of this *Prana vayu* leads to the derangement of *Vyana*, *Samana*, *Apana*, etc. Vitiating *Samana Vayu*, associated with *Rajo Guna*, further causes *Agni Dusti*. [8]

MANSIK BHAVAS ACTING AS STRESSOR.

Stressors are external or internal factors that induce stress, triggering a physiological and psychological response in an individual. These factors can vary widely and affect people differently [9]. Here are the main categories of stressors:

In *Ayurveda*, "*Mansik Bhavas*" refer to mental and emotional states that can act as stressors. The following are the types of stressors given in Table 1.

Table 1. Types Of Stressors

| | |
|----------------------|--|
| Emotional | Anger, fear, worry, jealousy, grief, guilt |
| Psychological | Anxiety, depression, perfectionism, low self-esteem |
| Environmental | Noise, pollution, overcrowding, extreme temperatures |
| Physical | Injury, illness, chronic pain |
| Social | Relationship conflicts, peer pressure |
| Work-related | Job insecurity, deadlines, workload |
| Financial | Debt, financial instability, unemployment |
| Life Events | Divorce, death of a loved one, relocation |

Further, the emotional stressors can be classified as *Manas Bhavas*. The following are the main *Manas Bhavas* causing stress:

Krodha (anger): When a person experiences anger, whether it's due to frustration, perceived injustice, or other reasons, it can activate the body's stress response system. Anger typically involves an increase in heart rate, blood pressure, and levels of stress hor-

mones like cortisol and adrenaline. These physiological changes prepare the body for action, often defensive or aggressive.

Bhaya (fear): Fear is a natural response to perceived danger or threat. It triggers a cascade of physiological reactions to prepare the body to either confront the threat (fight) or escape it (flight). Fear can lead to heightened arousal, increased muscle tension, rapid breathing, and activation of the sympathetic nervous system, all characteristic of the stress response.

Shoka (grief): Grief is the emotional response to loss, whether it's the loss of a loved one, a relationship, a job, or any significant change or transition. The grieving process involves a range of emotions, such as sadness, despair, anger, guilt, and longing. These intense emotions can lead to stress responses in the body, including changes in appetite, sleep disturbances, and mood and energy levels.

Chinta (worry): Worry involves anxious thoughts or concerns about potential future events or outcomes. Chronic worry can lead to persistent apprehension, restlessness, and uncertainty. Physiologically, worry can trigger the body's stress response, leading to an increased heart rate, elevated blood pressure, muscle tension, and changes in breathing patterns. This chronic activation of the stress response can contribute to fatigue, difficulty concentrating, and sleep disturbances.

Irshya (jealousy): Jealousy arises from insecurity, fear of loss, or perceived threat to a relationship or desired possession. It involves emotional distress and can lead to negative thoughts, suspicion, and resentment towards others. These emotions can activate the stress response, causing physiological changes similar to those experienced with fear and anger, such as increased heart rate, heightened arousal, and hormonal changes.

Kama (lust): Lust is an intense desire or craving, often related to physical or sexual attraction. At the same time, not inherently harmful, intense or obsessive lust can lead to stress if it becomes a preoccupation that disrupts daily functioning or causes emotional turmoil. It may trigger physiological responses associated with arousal, including increased heart

rate, adrenaline release, and changes in mood and behaviour.

Lalach (greed): Greed involves an intense desire for material possessions, wealth, or power beyond what is necessary for one's well-being. It can lead to dissatisfaction, competitiveness, and a constant pursuit of more. Greed can be stressful, as it often involves anxiety about losing what one has or not gaining more, which can impact emotional stability and lead to chronic stress responses.

Each of these emotions can vary in intensity and duration, but when experienced chronically or intensely, they can contribute to ongoing stress and its associated effects on physical and mental health. Chronic stress resulting from prolonged exposure to these emotions has been linked to a variety of health issues, including cardiovascular disease, digestive disorders, weakened immune function, and mental health disorders like anxiety and depression.

GUT-BRAIN AXIS

The brain-gut axis is the bidirectional communication between the central nervous system (CNS) and the gastrointestinal (GI) tract. This communication occurs through neural, hormonal, and immunological pathways^[10].

Components of the Brain-Gut Axis:

- **Central Nervous System (CNS):**
 - The brain, specifically the hypothalamus, amygdala, and other regions involved in emotional and cognitive functions, sends signals to the gut.
 - These signals can influence gut motility, secretion, and sensitivity.
- **Enteric Nervous System (ENS):**
 - Often referred to as the "second brain," the ENS is a complex network of neurons within the walls of the GI tract.
 - It regulates local gut functions independently of the CNS but communicates bidirectionally with the brain.
- **Autonomic Nervous System (ANS):**
 - The sympathetic and parasympathetic branches of the ANS regulate gut functions such as motility and blood flow.
- **Hormonal Pathways:**

- Hormones such as serotonin, dopamine, and cortisol produced in the brain influence gut function and vice versa.
- Gut hormones like gastrin, ghrelin, and peptide YY can affect brain functions related to appetite and mood.
- **Microbiota:**
 - The gut microbiota (the community of microorganisms residing in the GI tract) plays a crucial role in the brain-gut axis.
 - Microbes produce neurotransmitters and metabolites that can influence brain function and behaviour.

Functions and Implications:

- **Emotional Influence on Gut:** Stress, anxiety, and depression can affect gut function, leading to conditions like irritable bowel syndrome (IBS).
- **Gut Influence on Brain:** Gut microbiota and their metabolites can impact brain health, influencing mood disorders and neurodegenerative diseases.
- **Clinical Implications:** Understanding the brain-gut axis has led to novel therapeutic approaches, such as probiotics, prebiotics, and dietary interventions, for conditions involving both the brain and gut.
- **EFFECT OF STRESS ON THE GUT-BRAIN AXIS**

Stress profoundly affects the brain-gut axis, a bidirectional communication system between the central nervous system (CNS), which includes the brain and spinal cord, and the enteric nervous system (ENS), which controls the gastrointestinal (GI) tract. This axis is crucial in regulating various physiological processes related to digestion, motility, immune function, and emotional responses^[11]. Here's how stress impacts the brain-gut axis

1. Activation of the Hypothalamic-Pituitary-Adrenal (HPA) Axis: When a person experiences physical or psychological stress, the hypothalamus in the brain triggers the release of corticotropin-releasing hormone (CRH). CRH stimulates the pituitary gland to release adrenocorticotropic hormone (ACTH), which prompts the adrenal glands to produce cortisol and adrenaline (epinephrine).

These stress hormones prepare the body for the "fight-or-flight" response^[12].

- 2. Effects on Gut Permeability:** Stress hormones like cortisol can affect the permeability of the intestinal barrier. Increased cortisol levels have been associated with a decrease in tight junction proteins that maintain the integrity of the gut lining. This may lead to increased intestinal permeability (leaky gut), allowing undigested food particles, toxins, and bacteria to enter the bloodstream, triggering immune responses and inflammation^[13].
- 3. Alterations in Gut Microbiota:** Stress can disrupt the balance of gut microbiota, which is crucial for maintaining gut health and influencing immune function. Changes in gut microbiota composition due to stress may contribute to gastrointestinal symptoms such as bloating, diarrhoea, or constipation^[14].
- 4. Impact on Gut Motility:** Stress can influence gut motility and food movement through the digestive tract. Acute stress may lead to the rapid movement of food (hypermotility), resulting in diarrhoea or urgency, while chronic stress can slow down gut motility (hypomotility), causing constipation or bloating^[15].
- 5. Neurotransmitter Alterations:** The brain-gut axis involves neurotransmitters such as serotonin, dopamine, and gamma-aminobutyric acid (GABA), which play roles in brain function and gut motility. Stress can disrupt the balance of these neurotransmitters, contributing to changes in gut function and emotional responses^[16].
- 6. Visceral Sensitivity:** Stress can heighten visceral sensitivity, making the gut more sensitive to stimuli that usually would not cause discomfort. This can lead to symptoms such as abdominal pain, cramping, or a sensation of fullness^[17].
- 7. Psychological Factors:** Conversely, gastrointestinal symptoms resulting from stress can further exacerbate psychological distress, creating a cycle of worsening symptoms. This interplay highlights the complex relationship between emotional well-being and gut health^[18].

Understanding the impact of stress on the brain-gut axis underscores the importance of stress management techniques such as mindfulness, relaxation exercises, regular physical activity, and maintaining a healthy diet. These strategies support overall mental and emotional health and promote a balanced gut environment and digestive function.

DISCUSSION

Ayurveda and modern point of view agree that different *Mansik Bhavas*, like *Chinta*, *Shoka*, *Kama*, *Krodh*, etc., can lead to or act as *Hetu* for any disease. Hence, a relationship exists between these *Mansik Bhavas* and *Sharirik Vyadhi Utpatti*. So, these *Mansik Bhavas* affect the body. Emotional states directly impact the balance of *Doshas* (*Vata*, *Pitta*, and *Kapha*). Certain emotions like anger, fear, stress, and grief can disturb the natural balance of *Doshas*, leading to their aggravation. When *doshas* are imbalanced, digestion and metabolism are affected, potentially resulting in the formation of *Ama*. In healthy humans, anger, fear, grief, jealousy, etc., are considered “*Manas Bhavas*,” known as stressors in modern science and are the causes of slow gastric emptying. Stress tends to affect the normal functions of the digestive system.

The large intestine is particularly sensitive to stress, which tends to slow or even stop its activity and is a significant cause of constipation. Stress, whether acute or chronic, disrupts the normal functioning of the gastrointestinal tract. It impedes digestion and absorption processes, accumulating undigested substances known as *Ama* in *Ayurveda*. This accumulation can occur due to impaired enzymatic activity and altered motility under stress-induced conditions. Stress influences the composition of gut microbiota, promoting dysbiosis. This imbalance can further exacerbate *Ama* formation through various mechanisms. Dysbiosis may impair digestion and increase the production of toxins and inflammatory molecules, contributing to the accumulation of *Ama*. Another critical aspect discussed is stress-induced alterations in intestinal permeability. Increased permeability allows toxins and undigested particles to leak into the bloodstream, triggering systemic inflammation and poten-

tially enhancing *Ama* circulation and tissue deposition. The article emphasises how stress contributes to the formation of *Ama*. To prevent or reduce the formation of *Ama* caused by stress, *Ayurveda* emphasises the importance of managing stress through yoga, meditation, and mindfulness practices. Additionally, maintaining a balanced diet, healthy lifestyle habits, and incorporating *Ayurvedic* Herbs and therapies can support digestion, enhance detoxification, and promote overall well-being. By addressing stress holistically, individuals can mitigate its adverse effects on digestion and prevent the accumulation of *Ama*, thereby supporting optimal health and vitality.

CONCLUSION

Understanding the complex interplay between stress, the Gut-Brain Axis, and *Ama* formation is crucial for developing effective therapeutic interventions. Healthcare strategies that address stress management and promote gut health can potentially alleviate the burden of *Ama*-related disorders and enhance overall well-being. Further research into specific mechanisms linking stress to *Ama* formation and clinical outcomes is warranted to refine targeted interventions and improve patient outcomes.

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