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From Doshas and Dopamine: An Ayurvedic Insight into Adolescent Anxiety

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ABSTRACT

Adolescence is a transitional period marked by rapid biological, psychological, and social transformations. It is characterized by heightened emotional reactivity, identity exploration, and increased vulnerability to anxiety and behavioural disorders. Modern neuroscience attributes this to the asynchronous maturation of the limbic system and prefrontal cortex, resulting in heightened affective sensitivity and immature impulse regulation. Ayurved, centuries earlier, described this stage as a period of *Vata-Pitta* predominance and *Manovikara* susceptibility due to instability of *Manas* (mind) and fluctuating *Doshas*. This study explores the parallels between neurobiological mechanisms (dopaminergic reward pathways, hormonal surges, and stress reactivity) and Ayurvedic principles (Dosha dynamics, *Satva-Rajas-Tamas* balance, and *Ojas* preservation). It further proposes integrative strategies—drawing from *Satvavajaya Chikitsa*, *Medhya Rasayana*, and lifestyle modulation—to enhance emotional stability among adolescents. Understanding anxiety "from Doshas to dopamine" provides a bridge between traditional and modern paradigms, advocating a holistic model for adolescent mental health care.

KEYWORDS: Ayurved, Anxiety, Adolescence, Dosha, Dopamine, Satvavajaya

INTRODUCTION

Adolescence is often described as a period of "storm and stress," a term popularized by G. Stanley Hall, capturing the emotional turbulence and behavioural experimentation typical of this developmental stage[1]. Biologically, it corresponds to a phase of early maturation of the gonads, increased sex steroid production, and reorganization of the limbic–prefrontal circuitry[2,3]. This mismatch, where emotional centers (amygdala) mature earlier than regulatory regions (prefrontal cortex)[4], leads to heightened impulsivity, risk-taking, and emotional dysregulation, predisposing adolescents to anxiety and mood disorders[5,6].

Epidemiological studies suggest that girls experience anxiety earlier and more intensely than boys due to faster biological maturation, sociocultural stress, and heightened interpersonal sensitivity[7,8]. In boys, delayed maturation often manifests as externalizing behaviors, aggression, or substance experimentation[9].

From an Ayurvedic perspective, this stage corresponds to a shift in *Dosha predominance*: the stable *Kapha* of childhood gives way to *Pitta* (growth, transformation) and *Vata* (instability, movement)[10]. Classical texts such as *Charaka Samhita* describe *Vata* as the controller of *Manas* and *Indriyas*; when aggravated, it produces restlessness, fear, and indecision—features remarkably consistent with modern constructs of anxiety[11].

Adolescence is a crucial transitional period between childhood and adulthood, typically spanning 10 to 19 years, and is marked by profound biological, cognitive, emotional, and social transformations. During this phase, individuals undergo rapid physical growth, sexual maturation, and restructuring of brain systems that govern emotion and decision-making. Simultaneously, social roles, relationships, and expectations expand, making adolescence a uniquely sensitive and formative stage of life for adolescents.

1. Biological and Physical Maturation

Pubertal onset triggers the activation of the hypothalamic–pituitary–gonadal (HPG) axis, leading to the secretion of sex hormones: estrogen, progesterone, and testosterone. This hormonal surge results in the development of secondary sexual characteristics, growth spurts, and increased metabolic activity[12]. Girls typically mature earlier than boys, which often contributes to greater emotional sensitivity and anxiety during early adolescence than in boys. Early maturation can create mismatched emotional and cognitive readiness, increasing vulnerability to social pressure and body image concerns[13].

From an Ayurvedic perspective, this stage marks a transition from Kapha dominance to Pitta and Vata predominance in the body. [10] *Pitta* governs metabolism, transformation, and intellect, whereas *Vata* regulates movement, neural activity, and sensory processing. Rapid physical and hormonal changes correspond to *Pitta* activity, whereas mood fluctuations, restlessness, and irregular routines reflect *Vata* aggravation. Ayurved thus predicts this phase as one of instability (*Chanchalata*) and emotional turbulence (*Manasik Udvega*), requiring balancing interventions to preserve harmony.

2. Cognitive and Neurodevelopmental Changes

Adolescence is characterized by ongoing brain maturation, particularly in the limbic system (emotion and reward processing) and prefrontal cortex (judgment, planning, and impulse control). The limbic system matures earlier, driving strong emotional experiences and novelty, while the prefrontal cortex, responsible for executive regulation, lags. This asynchrony between the "emotion and control" systems explains why adolescents may show impulsivity, risk-taking, or heightened anxiety.

Ayurved correlates this neurobiological imbalance with disturbances in Vata and Rajas. [11]*Vata* governs the nervous system and sensory perception, whereas *Rajas* drives passion, desire, and restlessness. When unbalanced, they cause *Manovikara* (mental disorders) such as *Udvega* (anxiety), *Bhaya* (fear), and *Chittodvega* (emotional agitation)[14]. Cultivating *Satva*—the quality of calmness, clarity, and wisdom—through *Satvavajaya Chikitsa* (Ayurvedic psychotherapy), yoga, and mindfulness can support the regulation functions of the developing brain.

3. Psychosocial Development and Social Attention

Adolescence is also the period when all eyes turn outward—toward peers, acceptance, and social identity. Self-consciousness increases, and adolescents become sensitive to how others perceive them. Peer influence often overrides parental direction, and social comparison (especially in the age of digital media) significantly shapes self-esteem and mood.

Ayurved views this heightened external focus as a manifestation of Rajas guna, the dynamic, outward-seeking principle of the mind. While Rajas drives motivation and social engagement, excessive stimulation—through peer competition, social media, or constant comparison—disturbs mental equilibrium and *Satva*, fostering anxiety and emotional instability.

4. Family Interaction and Environmental Factors

The family environment plays a significant role in adolescence. Supportive communication, emotional warmth, and autonomy-promoting parenting strengthen resilience, whereas harsh discipline, emotional neglect, and over-expectation increase stress. Parental expectations, especially regarding academics and behavior, can contribute to performance anxiety and self-doubt. Additionally, exposure to family conflict, substance abuse, or harassment intensifies emotional and behavioral dysregulation.

Ayurved recognizes the family as a key factor in *Manasika Swasthya* (mental health). [(15)] A nurturing home sustains *Ojas* (vital energy) and strengthens *Satva*, whereas chronic stress depletes *Ojas*, leading to fatigue, poor immunity, and *Manas vikara*. Positive relationships and compassion-based parenting are forms of *aashwasana (reassurance)*—a core element of *Satvavajaya Chikitsa*.

5. Psychosocial Stressors: Abuse, Drugs, and Harassment

The adolescent's search for independence often exposes them to risk behaviour is such as substance use, peer pressure, or sexual experimentation. Exposure to bullying, harassment, or abuse—whether physical, emotional, or online—significantly heightens the risk of developing internalizing disorders (like anxiety and depression) and externalizing behaviours (like aggression and defiance).

Ayurvedically, such behaviour's represent derangement of *Rajas* and *Tamas*—where *Rajas* drives impulsivity and *Tamas* clouds discernment (*Buddhi*). Restoration of *Satva guna* through discipline, spiritual guidance, and supportive environments is essential to bring mental stability.

6. Emotional and Behavioural Disorders in Adolescence

This period shows the peak onset of mental disorders, accounting for over half of lifetime psychiatric conditions. Common internalizing disorders include *anxiety*, *depression*, and *somatic complaints*, while externalizing disorders include *Attention-Deficit/Hyperactivity Disorder (ADHD)*, *Oppositional Defiant Disorder (ODD)*, *Conduct Disorder*, and substance misuse. Some adolescents may also present with *intellectual disability* or neurodevelopmental conditions affecting adaptive functioning.

From the Ayurvedic viewpoint:

- **ADHD / Impulsivity** → *Vata vitiation* (hyperactivity, instability)

- **ODD / Conduct disorders** → *Rajas–Tamas aggravation* (anger, inertia, aggression)
- **Anxiety and Depression** → *Vata–Tamas imbalance* (fear, hopelessness, withdrawal)
- **Intellectual Disability** → *Deficit in Dhi, Dhriti, Smriti* (intellect, determination, memory) These correspondences highlight Ayurved's integrated approach —treating both mind (*Manas*) and body (*Sharira*) through personalized Dosha balancing, herbal nootropics (*Medhya Rasayana*), and psychospiritual training.

7. Integrating Ayurveda and Modern Neurobiology

Both systems—modern neuroscience and Ayurved—describe adolescence as an era of neural plasticity and energetic transformation. Dopamine-driven reward sensitivity in neuroscience aligns with *Rajas* activation, promoting curiosity and growth but also risk. Similarly, prefrontal cortex immaturity mirrors weakened *Dhriti* (restraint) and *Smriti* (memory), while emotional hyperreactivity parallels *Vata* disturbance.

Hence, both Ayurved and neuroscience recognize adolescence as a period of instability and reorganization—physically, mentally, and emotionally. Understanding the neurobiological underpinnings alongside Ayurvedic principles may yield more culturally coherent, holistic interventions for adolescent anxiety.

MATERIALS AND METHODS

This conceptual review synthesizes findings from:

- **Modern scientific databases** (PubMed, Scopus, Google Scholar) on adolescent neurodevelopment, dopaminergic mechanisms, and anxiety (2010–2025).
- **Classical Ayurvedic texts** (*Charaka Samhita* , *Sushruta Samhita* , *Ashtanga Hridaya*).
- **Comparative thematic analysis** aligning neurobiological processes with Ayurvedic constructs of *Dosha* , *Manovikara* , and *Satva-Rajas-Tamas* .

OBSERVATIONS -

1. Neurobiology of Adolescent Anxiety

- **Limbic System Maturation:** The amygdala and ventral striatum (emotion and reward centres) mature earlier, heightening reactivity to stress and reward cues.
- **Delayed Prefrontal Cortex Development:** Executive control, judgment, and impulse regulation lag , explaining emotional volatility and anxiety.

- **Dopaminergic Sensitivity:** Increased dopamine receptor expression enhances novelty looking for but also emotional dysregulation.
- **Sex Differences:** Early maturing girls show higher cortisol reactivity and anxiety; boys display externalizing behaviour is due to testosterone-driven risk-taking.
- **Environmental Amplifiers:** Academic pressure, social media exposure, and sleep deprivation function as stressors activating the HPA axis.

2. Ayurvedic Interpretation

Dosha Dynamics:

- *Kapha kala* (childhood) transitions into *Pitta-Vata kala* (adolescence).
- *Pitta* governs transformation and intellect; *Vata* governs movement, emotion, and nervous activity.
- Aggravated *Vata* manifests as restlessness, fear (*Bhay*), and insomnia—mirroring anxiety symptoms.

Manovikara: Anxiety parallels *Chittodvega* and *Udvega* , conditions arising from *Rajas* (activity, restlessness) and *Tamas* (inertia, confusion).

Satva–Rajas–Tamas Balance: Healthy adolescents display *Satva predominance* (clarity, courage, discipline); imbalances toward *Rajas* / *Tamas* produce mood swings and impulsivity.

Ojas and Prana: Chronic anxiety depletes *Ojas* (vital essence), impairing immunity and cognition—analogous to modern stress-induced allostatic load.

3. Integrative Model: "From Doshas to Dopamine"

Modern Neurobiology	**Ayurvedic Concept**	**Manifestation**
Limbic hyperreactivity	Vata aggravation	Restlessness, fear
Dopaminergic reward drive	Pitta–Vata excitation	Impulsivity, risk-taking
Prefrontal immaturity	Weak *Dhi–Dhriti–Smriti*	Poor decision making
Chronic stress response	Ojas depletion	Fatigue, poor focus
Hormonal surge	Agni imbalance	Emotional volatility

4. Neuro-Ayurvedic Mechanisms Linking Doshas and Dopamine

During adolescence, neurodevelopmental asymmetry arises between a hyper-responsive limbic system and a still-maturing prefrontal cortex, heightening sensitivity to novelty, reward, and peer evaluation. Dopaminergic surge within the mesolimbic pathway parallels the Ayurvedic description of Vata fluctuation and Rajas excitation—manifesting as restlessness, anxiety, and risk-seeking behaviour. Simultaneously, hormonal elevation in oestrogen and testosterone reflects Pitta Agni intensification, producing emotional reactivity and competitive drive. Chronic stress or social rejection activates the HPA-axis, resulting in cortisol dysregulation; Ayurved interprets this as depletion of Ojas and aggravation of Vata Rajas, leading to mental instability (Chittodvega). When prefrontal cortical control (Buddhi and Dhriti) is strengthened through Satvavajaya Chikitsa - [16] the science of conquering the mind. Meditative discipline, ethical conduct, and regulation of sensory inputs—neuroplastic adjustments restore inhibitory balance between cortical and limbic regions. Thus, classical mind management and modern neuroscience converge on the same regulatory axis between emotional reactivity and executive control.

DISCUSSION

Adolescence is a unique and transitional phase of life characterized by profound physical, cognitive, emotional, and social transformations. During this stage, the individual undergoes rapid bodily changes due to hormonal surges, early maturation, and activation of the hypothalamic–pituitary–gonadal axis. These changes, particularly in girls who mature earlier than boys, lead to heightened emotional sensitivity and social self-consciousness. Adolescents become increasingly aware of their appearance, identity, and peer acceptance; their attention is drawn outward, seeking validation, and belonging in the social sphere. These shifts are accompanied by evolving patterns of thinking and decision-making as the cognitive system begins to mature but stays vulnerable to impulsivity and emotional reactivity.

From a neurobiological perspective, adolescence is defined by an asynchrony in brain maturation: the limbic system, responsible for emotion and reward processing, develops earlier than the prefrontal cortex, which governs judgment, impulse control, and long-term decision-making. This imbalance contributes to emotional volatility, risk-taking, and a tendency toward anxiety and mood disturbances. Increased dopaminergic activity during this period enhances reward sensitivity, while immature prefrontal control amplifies impulsive behaviours. As a result, adolescents experience internal conflicts between emotional impulses and rational thought, often struggling to keep equilibrium. These neurochemical and structural changes explain the

vulnerability to emotional and behavioural disorders, including anxiety, depression, ADHD, oppositional defiant disorder, and conduct disorders.

Ayurved offers a remarkably parallel explanation of these processes through the lens of *Dosha* and *Guna* theory. The adolescent phase corresponds to a predominance of *Pitta* and *Vata doshas*. *Pitta* symbolizes transformation, metabolism, and intellect, while *Vata* governs motion, nervous activity, and communication. Excessive *Vata* leads to instability, restlessness, and overthinking—mirroring the neurobiological overactivation of the limbic system and dopaminergic circuits. Similarly, *Pitta* aggravation reflects the intensity, competitiveness, and emotional reactivity typical of adolescence. When these doshas are not balanced, they disturb the mental *gunas—Satva*, *Rajas*, and *Tamas*—resulting in mental agitation (*Rajas*), confusion (*Tamas*), and loss of emotional steadiness. Ayurved finds this disturbed state as *Chittodvega*, closely corresponding to modern concepts of anxiety and mood dysregulation. Ayurved emphasizes harmonious family relationships, ethical conduct (*Sadvritta*), and emotional reassurance (*Aashwasana*) as essential components for supporting mental equilibrium—concepts that correspond closely with modern family therapy and positive psychology.

Social interactions during adolescence also contribute to heightened self-awareness and comparison. The adolescent mind, driven by *Rajas guna*, becomes highly reactive to external opinions and validation. Peer rejection, bullying, harassment, or exposure to substance abuse can further destabilize emotional balance. These experiences may give rise to both internalizing problems, such as anxiety and depression, and externalizing patterns, like aggression and conduct issues. Both conditions are indicative of disturbed *Manas doshas* and require restoration of *Satva guna* through lifestyle regulation, mental discipline, and herbal support.

Modern lifestyle factors also worsen adolescent stress. Irregular routines, lack of sleep, junk food consumption, and excessive screen exposure all aggravate *Vata dosha*. Digital overstimulation mirrors *Vata's* properties of irregularity and instability, leading to restlessness, insomnia, and poor concentration. Ayurved's guidelines of *Dinacharya* (daily regimen), *Ritucharya* (seasonal regimen), and *Nidra* (proper sleep) offer practical preventive tools that align with modern scientific principles of circadian rhythm and stress management. Balanced nutrition (*Ahara Vidhi*), regular physical activity, and mindful living stabilize both body and mind, reducing anxiety and emotional fluctuations.

Adolescent anxiety is diagnosed based on standardized psychiatric criteria and validated assessment tools. The DSM-5-TR (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision) classifies anxiety disorders into categories such as generalized anxiety disorder, social anxiety disorder, panic disorder, separation anxiety disorder, and specific phobias. The ICD-11 (International Classification of Diseases) similarly includes "Anxiety and Fear-Related Disorders" under its mental and behavioural section.

Assess anxiety severity and domains, various psychometric scales are used in adolescents. Commonly employed tools include the SCARED (Screen for Child Anxiety Related Emotional Disorders), RCADS (Revised Child Anxiety and Depression Scale), and Spence Children's Anxiety Scale (SCAS), which evaluate specific symptom clusters aligned with DSM and ICD criteria. Clinicians also use general measures such as the Hamilton Anxiety Rating Scale (HAM-A) and the State–Trait Anxiety Inventory for Children (STAI-C) to quantify symptom intensity and differentiate situational from persistent anxiety traits.

Interventions suggested by Ayurveda:

- **Lifestyle (Dinacharya):** Regular sleep, balanced diet, avoidance of overstimulation (screen detox), adequate rest, and recreation.
- **Diet (Ahara):** *Satvik* food—fresh, light, mildly spiced; reduces *Rajas–Tamas* .
- **Medhya Rasayana:** *Brahmi, Shankhpushpi, Mandukaparni, Yashtimadhu* —herbs enhancing cognition and emotional balance.
- **Yoga and Pranayama:** Reduce limbic hyperactivation; improve vagal tone and executive control.
- **Satvavajaya Chikitsa:** Counselling based on *Aashwasana (reassurance)* and *Buddhi Nirdesha (guidance)* .

Modern science corroborates these through evidence of:

- **Neuroplastic changes** induced by meditation and yoga.
- **HPA axis modulation** by adaptogenic herbs like *Brahmi* and *Ashwagandha* .
- **Improved executive function** via mindfulness and lifestyle regularity.

CONCLUSION

Adolescence stands at the crossroads of transformation, where curiosity collides with confusion and the mind learns the delicate art of balance. The interplay between biological maturation and emotional evolution makes this stage both powerful and fragile. Modern neuroscience unravels this journey through synapses, hormones, and circuits, while Ayurved interprets it through Doshas, Gunas, and the strength of Manas. Together, they portray the adolescent mind not as a problem to be managed, but as a potential to be guided. [17]

The mind in childhood and youth through discipline grants lifelong stability and happiness. Anxiety, within this framework, is not merely a symptom of imbalance but a signal of growth seeking direction. The convergence of neurobiology and Ayurveda reminds us that well-being is multidimensional woven from neural regulation, lifestyle rhythm, ethical living, and emotional nourishment. The harmony between prefrontal control and limbic emotion mirrors the Ayurvedic pursuit of equilibrium between Satva, Rajas, and Tamas. True resilience in adolescence arises when this harmony is cultivated through awareness, compassion, and discipline of both thought and conduct.

The dialogue between ancient wisdom and modern science opens a new horizon for adolescent mental health. It invites educators, parents, and clinicians to see beyond pathology—to nurture emotional intelligence, self-regulation, and mindful living. “From Doshas to Dopamine” thus symbolizes not a comparison of two worlds but a union of insight and empathy. It envisions a future where the science of the brain and the wisdom of Ayurved walk together—guiding young minds toward clarity, courage, and calm amidst the turbulence of growing up.

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