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Precocious Puberty: A Comparative and Integrative Review of Unani and Modern Medical Perspectives

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Abstract
Precocious puberty refers to the premature onset of secondary sexual characteristics before eight years in girls and nine years in boys. It represents a deviation from the natural rhythm of growth and development described in both Unani and modern medical systems. Classical Unani scholars such as Ibn Sina, Al-Razi, Jurjani, and others identified similar conditions though they did not use the modern term, attributing early maturity to excessive innate heat (*Ghalabat-e-Harārat-e-Gharīziyya*) and imbalance of temperament (*Sue Mizaj*). Modern endocrinology associates the condition with premature activation of the hypothalamic–pituitary–gonadal (HPG) axis, obesity, and exposure to endocrine-disrupting chemicals. This review explores conceptual parallels, etiological mechanisms, and management approaches across both traditions. Integrating Unani theories of temperament regulation with evidence-based endocrine management offers a holistic approach to prevention and therapy. Unani regimens emphasizing *Ilaj bil Ghiza* (dietary regulation), *Ilaj bil Dawa* (pharmacotherapy), and *Ilaj bil Tadbeer* (regimental therapy) align conceptually with lifestyle modification, hormonal regulation, and psychosocial support in modern practice.

Keywords: Precocious Puberty, Unani Medicine, *Harārat-e-Gharīziyya*, HPG Axis, Integrative Endocrinology

Introduction
Puberty marks the transition from childhood to sexual maturity through activation of the hypothalamic–pituitary–gonadal (HPG) axis. Under normal conditions, this process begins between 8–13 years in girls and 9–14 years in boys. Precocious puberty is defined by the onset of secondary sexual features before eight years in girls or nine years in boys [1]. This condition is classified into two main types — central (gonadotropin-dependent) and peripheral (gonadotropin-independent) precocious puberty — based on whether it arises from early activation of the HPG axis or from extragonadal hormone production [2, 3]. Global prevalence is approximately 1 in 5,000 children, with a female predominance [4].
Modern research attributes this trend to factors such as childhood obesity, endocrine-disrupting chemicals, psychosocial stress, and altered nutrition [5]. In India, idiopathic central precocious puberty (CPP) remains relatively uncommon; central nervous system lesions and infections are notable causes [6].
In Unani medicine, early sexual maturity has long been acknowledged as a disturbance of natural growth resulting from excessive *Hararat-e-Gharīziyya* (innate heat) and *Sue Mizaj Har* (hot morbid temperament). Unani scholars have described *Bulugh* (puberty) as a stage of life influenced by the balance between *Hararat* (heat) and *Rutoobat* (moisture), and its premature occurrence as a pathological deviation [7, 8] *Ibn Sina* states in *Al-Qanun fi'l-Tibb* that excessive innate heat accelerates the maturation of bodily organs, leading to early appearance of adult features — a condition that demands cooling regimens and moderation in diet [7]. *Jurjani* in *Zakhira Khwarzam Shahi* similarly attributes early development to overfeeding and warm environments [8].
This review provides an integrative analysis of Unani and modern medical perspectives to elucidate the conceptual, diagnostic, and therapeutic parallels in managing precocious puberty.

Methods
Information was compiled from primary Unani texts including Al-Qanun fi'l-Tibb, Al Hawi,

Zakhira Khwarzam Shahi, and Kamil-us-Sana'a, along with modern studies (Kaplowitz, 2008; Soliman *et al*., 2023; Cheng & Wan, 2025; Kumar *et al*., 2015; Dayal *et al*., 2020) [5, 15, 6, 16]. Comparative analysis was applied to align traditional theories with current medical understanding.

Terminology and Classical Description

In the Unani system of medicine, the concept of puberty (*Bulugh*) is discussed extensively in classical texts such as *Al-Qanun fi'l-Tibb* by *Ibn Sina (Avicenna)*, *Al-Hawi* by *Al-Razi (Rhazes)*, and *Zakhira Khwarzam Shahi* by *Jurjani*. Although these sources do not use the modern term "precocious puberty," they describe conditions equivalent to early or premature attainment of sexual maturity. The process of *Bulugh* is viewed as a natural developmental milestone that occurs when the *Hararat-e-Gharīziyya* (innate heat) becomes strong enough to transform *Rutoobat-e-Gharīziyya* (innate moisture) into mature semen and menstrual blood [7, 8] When this transformation occurs earlier than the normal physiological age, it is considered a pathological acceleration.

Ibn Sina states [9]:

"When innate heat becomes dominant and overcomes the moisture of the body before its due time, the organs mature rapidly, the hair appears early, and signs of manhood or womanhood manifest before the natural age."

Al-Razi in *Al-Hawi* links early maturity to *Ghalaba-e-Hararat* (excess heat) and dietary indulgence [10]:

"Children who are raised on rich and heating diets develop bodily growth and sexual vigor before others, but their strength declines earlier."

Jurjani, in *Zakhira Khwarzam Shahi*, adds that excessive nourishment, warm climate, and emotional excitation stimulate early maturity, emphasizing that moderation in diet and activity preserves the natural balance (*I'tidal-e-Mizaj*) [8].

Kamil-us-Sana elaborates that children with a hot and dry temperament and over-nutrition are particularly prone to early manifestation of secondary sexual characteristics, linking premature puberty to excessive internal heat and rapid organ differentiation [11].

Similarly, Firdous-ul-Hikmat notes that environmental factors, emotional excitement, and rich diet contribute to early maturation, while moderation in lifestyle and diet supports normal timing of puberty [12].

Thus, the classical Unani perspective attributes premature puberty to an imbalance in the fundamental qualities (*Kaifiyat*)—particularly an increase in heat and dryness—which hasten organ differentiation (*Tafarruq-e-Ittisāl*). The condition is viewed as an abnormal acceleration of growth and maturation, differing from natural *Bulugh* which typically occurs between the ages of fourteen and twenty-one years (*Sinn-e-Bulugh*) [13]

Concept of Normal Puberty (Unani and Modern)

Unani Concept

In Unani physiology, *Bulugh* marks the transition from the stage of childhood (*Sinn-e-Tufulat*) to youth (*Sinn-e-Shabab*). This stage begins when *Hararat-e-Gharīziyya* becomes strong enough to induce full development of sexual organs and reproductive capability. *Ibn Sina* describes *Bulugh* as the point when "the semen attains ripeness and the powers of generation appear" [7]. The normal age for *Bulugh* is variable and depends on *Mizaj* (temperament), climate, and dietary habits—occurring earlier in those with a warm temperament and in hot regions, and later in those with a cold temperament or living in colder climates [7].

Modern Concept

From the modern endocrinological perspective, puberty is defined as the biological process during which an individual attains reproductive capability and develops secondary sexual characteristics. The process is orchestrated by the activation of the hypothalamic–pituitary–gonadal (HPG) axis, leading to the secretion of gonadotropin-releasing hormone (GnRH), which stimulates the pituitary to release luteinizing hormone (LH) and follicle-stimulating hormone (FSH). These, in turn, stimulate gonadal steroidogenesis [4, 14]

In girls, the earliest sign of true puberty is breast budding (thelarche), which typically occurs around 10 years of age (range 8–12), followed by menarche approximately 2.5 years later (average 12.5 years). In boys, testicular enlargement to ≥ 4 mL is the first sign, usually appearing at an average age of 11.5 years (range 9.5–14) [14]. These changes are accompanied by accelerated growth velocity and hormonal fluctuations that ultimately lead to sexual maturity.

Table 1: Comparison of Normal Puberty in Unani and Modern Medicine

Aspect	Unani Medicine	Modern Medicine
Concept	Natural maturation of *Aza-e-Tanasul* (reproductive organs) through *Hararat-e-Gharīziyya*	Biological activation of the HPG axis leading to sexual maturation
Governing Factor	Balance of *Hararat* and *Rutoobat*	Activation of HPG axis
Age Range	14 – 21 years (*Sinn-e-Bulugh*)	Girls 8 – 13 yrs; Boys 9 – 14 yrs
Determinants	*Mizaj*, climate, diet, heredity	Genetics, nutrition, body composition
Early Onset Cause	*Ghalabat-e-Hararat*, rich diet	Obesity, endocrine disruptors, stress
Significance	Indicator of completion of growth power (*Quwwat-e-Namiyah*)	Onset of reproductive capacity

Etiopathogenesis

Precocious puberty is a multifactorial condition, and understanding its pathophysiology requires integrating classical Unani concepts with modern endocrinology. Both systems recognize intrinsic and extrinsic factors influencing the timing of puberty, albeit with different explanatory frameworks.

Unani Perspective [7-12]

In Unani medicine, early puberty is attributed primarily to internal imbalance of *Mizaj* (temperament) and external environmental factors:

- **Excessive *Hararat-e-Gharīziyya*** (innate heat): Accelerates organ maturation and tissue differentiation (*Tafarruq-e-Ittisāl*).
- **Sue Mizaj Har** (hot morbid temperament): Children

with naturally hot temperament show earlier sexual development.
- **Dietary factors**: Rich, heavy, or heating foods increase internal heat and hasten puberty.
- **Climate and environment**: Warm climates and overexposure to heat stimulate early maturation.
- **Emotional or physical excitations**: Excessive activity or stress may contribute to imbalance, accelerating *Bulugh*

Modern Perspective
Modern medicine classifies the causes of precocious puberty into central (gonadotropin-dependent) and peripheral (gonadotropin-independent):

Central Precocious Puberty (CPP):
1. Early activation of the HPG axis.
2. Most cases in girls are idiopathic (~90%), while in boys, CNS lesions (hypothalamic hamartomas, tumors, infections) are more frequent [14].
3. Influenced by obesity and high leptin levels, which can stimulate GnRH secretion [1].

Peripheral Precocious Puberty
- Caused by ectopic sex steroid production independent of the HPG axis.
- Examples: adrenal or gonadal tumors, McCune-Albright syndrome, exogenous estrogen or testosterone exposure [2, 3].

Environmental and Lifestyle Factors
Childhood obesity, high-calorie diets, exposure to endocrine-disrupting chemicals (plastics, pesticides), and psychosocial stress [5, 15].
Modern studies confirm that early puberty has both genetic and environmental determinants, with obesity being a leading modifiable risk factor.
Both Unani and modern perspectives converge on the notion that internal and external factors interact to accelerate pubertal onset, though the explanatory framework differs: Unani focuses on qualitative bodily balance (*Mizaj*), while modern medicine emphasizes hormonal and environmental mechanisms.

Clinical Aspects
Unani descriptions of early maturity include premature hair growth (*Shiqaq-e-Sha'r*), early organ development, irritability, and restlessness—reflecting an overheated temperament. Moderation of diet and lifestyle is advised to prevent progression.
Modern clinical features include early breast development (*thelarche*), pubic hair (*pubarche*), or menstruation (*menarche*) in girls, and testicular enlargement and penile growth in boys. Secondary effects include rapid linear growth, advanced bone age, and psychosocial distress [5].

Diagnostic Approach
Diagnosis focuses on determining the type and cause of early puberty. In Unani medicine, assessment is clinical—based on early hair growth (*Shiqaq-e-Sha'r*), organ development, and evaluation of *Mizaj* (temperament) to detect excess *Harārat-e-Gharīziyya* [7]. Modern endocrinology employs Tanner staging, bone age radiography, and hormonal assays of LH, FSH, and sex steroids. GnRH stimulation tests distinguish central from peripheral causes, while pelvic ultrasonography and brain MRI help exclude CNS lesions [6, 16].

Complications
Untreated precocious puberty may cause short adult stature from premature epiphyseal closure, obesity, insulin resistance, and psychosocial distress [5, 17]. Unani scholars describe similar outcomes as premature depletion of *Harārat-e-Gharīziyya* and early physical decline [8].
Both systems emphasize early detection and preventive balance of internal and external factors to ensure healthy maturation.

Management Strategies
Unani management
Classical Unani texts recommend a holistic approach aimed at restoring temperamental balance (*I'tidal-e-Mizaj*) and controlling internal heat:

Dietary Regulation (*Ilaj bil Ghiza*)
- Avoid heavy, heating, and rich foods that exacerbate *Hararat-e-Gharīziyya*.
- Emphasize cooling, easily digestible foods, vegetables, and moderate protein intake.
- Use of foods with mild *sard* (cool) temperament to balance internal heat.

Pharmacological Intervention (*Ilaj bil Dawa*)
- Use of cooling and demulcent formulations such as *Khus Khus (Poppy seeds), Sitafal (Custard apple), and other temperate herbs* to reduce internal heat and slow maturation.
- Medications selected based on individual *Mizaj* and humoral imbalance.

Regimental Therapy (*Tadbeer*)
- Practices such as massage (*Dalk*), exercise moderation, bath therapy, and controlled sleep to regulate bodily heat and growth.
- Avoid overexertion which may stimulate premature organ activity.

Lifestyle and Environmental Management
- Limit exposure to warm climates or excessive heat.
- Encourage balanced daily routines to prevent emotional and physiological excitations contributing to early puberty.

Modern Management
Modern medicine uses evidence-based interventions targeted at the underlying endocrine or systemic causes:

Central Precocious Puberty (CPP)
- GnRH analogues (e.g., leuprolide) to suppress premature activation of the HPG axis.
- Treatment continues until normal pubertal age is reached to preserve adult height [1].

Peripheral Precocious Puberty
- **Address underlying cause**: adrenal or gonadal tumour's, exogenous hormone exposure, or McCune-Albright syndrome.

- Surgery, medication, or hormonal blockade depending on etiology [2].

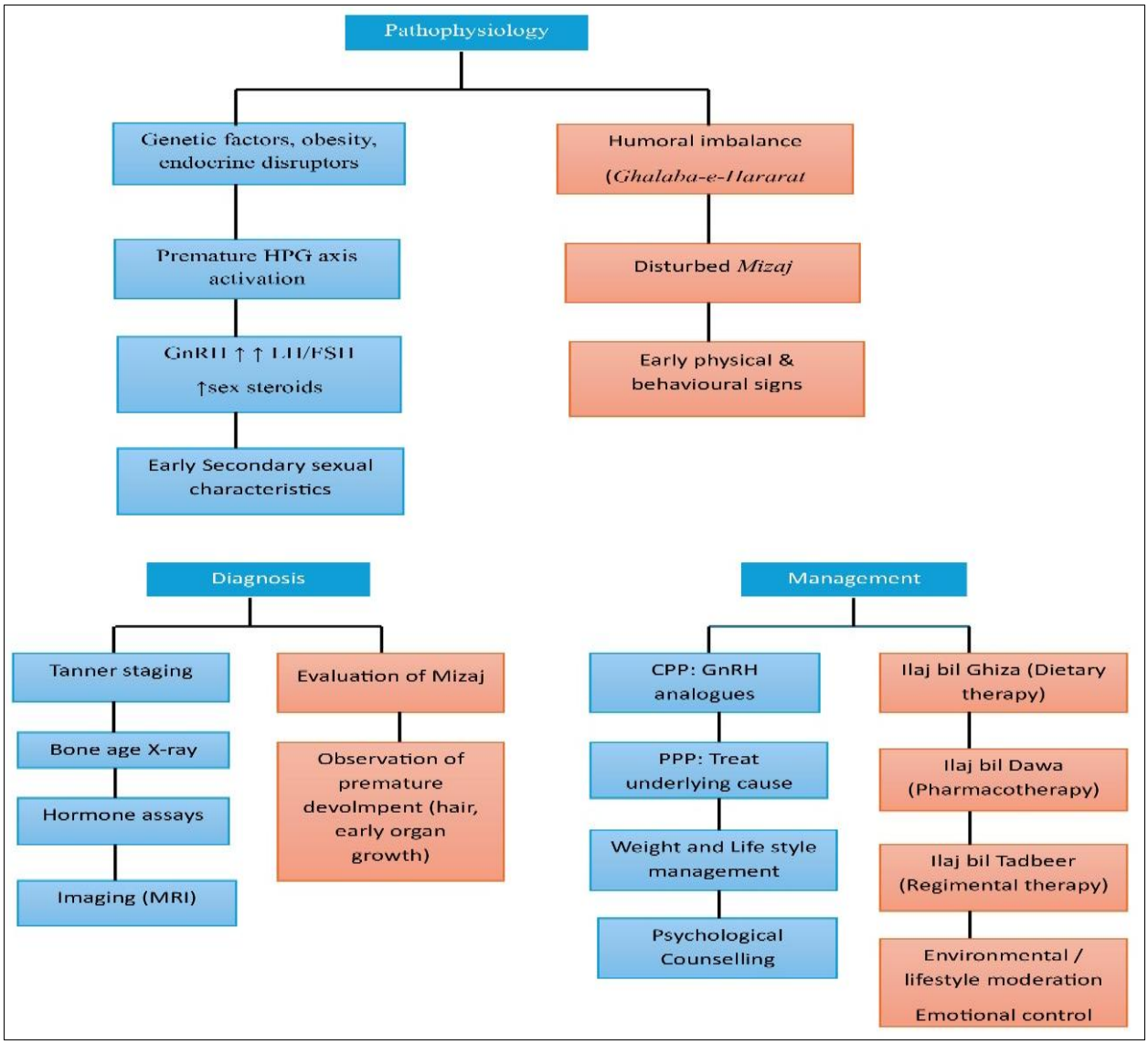
Lifestyle Modification

- Obesity management through dietary control and exercise.
- Psychological counselling to address emotional and social difficulties [5].

Monitoring and Follow-Up

a. Periodic assessment of growth velocity, bone age, and pubertal progression.
b. Adjust therapy according to clinical response and hormonal levels.

Flow chart: Modern vs Unani approach to precocious puberty



Preventive and Holistic Outlook

Unani medicine emphasizes balanced temperament, controlled diet, and environmental moderation. Preventive measures include avoiding overfeeding, excessive heat, and emotional stress. *Tadbeer* techniques—massage, exercise regulation, and cooling regimens—help maintain equilibrium.

Modern prevention parallels these principles, focusing on obesity prevention, avoidance of endocrine disruptors, and psychosocial counselling [18].

Current Research Trends

Epidemiological Studies

- Modern research emphasizes the increasing prevalence of early puberty in both developed and developing countries, often linked to childhood obesity and endocrine disruptors [1, 15].
- Indian studies highlight the role of CNS lesions and urban lifestyle changes as contributing factors [6, 16].

Hormonal and Genetic Insights

Advances in understanding GnRH neuron activation, leptin signaling, and genetic mutations (e.g., MKRN3, KISS1/KISS1R) have clarified the pathophysiology of central precocious puberty [5]

Integrative Medicine Research

- There is emerging interest in evaluating Unani interventions (dietary regulation, herbal formulations, and regimens) in conjunction with modern therapy.
- Studies suggest that lifestyle modification and natural cooling regimens may complement pharmacological

therapy in preserving adult height and regulating emotional health.

Future Directions

Integrative Clinical Trials

Conducting well-designed trials to evaluate the efficacy of Unani preventive and therapeutic measures alongside standard modern treatments.

Nutritional and Lifestyle Interventions

Developing evidence-based guidelines for dietary moderation, exercise, and environmental regulation in children at risk of early puberty.

Awareness and Education

- Promoting parental and community education regarding early signs, dietary factors, and environmental risks.
- Integrating Unani preventive principles in school health programs may provide culturally acceptable, holistic strategies.

Personalized Medicine

Using temporal and temperamental assessments (*Mizaj evaluation*) in combination with genetic and hormonal profiling to design individualized preventive and therapeutic strategies.

Integrating Unani principles of balance, moderation, and temperament regulation with modern diagnostics and therapy offers a promising multidisciplinary approach to precocious puberty. Future research may validate combined strategies to enhance growth potential, psychological health, and overall well-being in affected children.

Conclusion

Precocious puberty represents a complex developmental disorder recognized in both classical Unani medicine and modern endocrinology. While modern medicine emphasizes hormonal activation, genetic factors, and environmental triggers, Unani medicine provides a holistic understanding rooted in the balance of temperament (*Mizaj*), internal heat (*Hararat-e-Gharīziyya*), diet, and environmental factors.

Comparative analysis reveals several convergences and complementarities:

- Both systems recognize early physical signs—such as hair growth, breast development, and reproductive organ maturation—as critical indicators for intervention.
- Unani preventive principles—dietary moderation, regimens (*Tadbeer*), and lifestyle management—align conceptually with modern obesity control, lifestyle modification, and psychosocial support.
- Modern medicine provides precise diagnostic tools and pharmacological therapy, while Unani medicine offers holistic guidance to restore internal balance and reduce the risk of long-term complications.

Integrative approaches combining Unani preventive strategies and modern therapeutic interventions may optimize outcomes, improve psychosocial health, and preserve adult height in children with early puberty.

Future research should focus on clinical trials evaluating integrative management, the role of diet and lifestyle interventions, and personalized approaches that account for temperament, genetics, and environment. Such strategies have the potential to bridge classical wisdom with contemporary medical practice, offering culturally sensitive and comprehensive care for children experiencing precocious puberty.

Conflict of Interest

Not available

Financial Support

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