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The traditional system of Unani medicine, its origin, evolution and Indianisation: A critical appraisal

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Greco-Arab medicine, popular as a complementary or alternative medicine, is based largely on herbs and minerals. This was initiated by Hippocrates (460-377 BC) and his associates in Greece, but its preferred home today is the Indian sub-continent. It believes that every person has its own distinct temperament made up of combinations of four basic humors (blood, phlegm, yellow bile and black bile). A proper balance in quantity and quality of these humors indicates health, while imbalance represents a diseased condition. The temperament of individuals is influenced by a variety of internal and external factors. Treatment is done normally through regimental therapy, dietotherapy and/or pharmacotherapy. The nature of drugs (hot, cool, dry, wet, etc) is also taken into consideration. This therapy is known to have minimal side effects. It received the patronage of Delhi Sultans and Mughal Emperors for over 500 years (13th to 18th century) and is now advancing under the banner of Indian systems of medicine. This review discusses the basic principles and concepts as well as the systematic progress of Unani medicine and critically evaluates the strengths and weaknesses of this therapy in addition to highlighting the contributions of Indian *Hakims* (Unani physicians) to public health sector in India during the last seven centuries.

Keywords: Greeco-Arab medicine, Herbal drugs, Hippocratic philosophy, Humors, Temperament

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Greek philosopher, Hippocrates (460-370 BC) was the first to transform the raw concepts of medication into a logical and practical knowledge. He considered human body as an integrated system, which responds to and gets affected from the surrounding environment[1,2].

In the 4th century BC, during the reign of the Greek Emperor, Alexander the Great, the first regular course in medicine was taught in a School of Alexandria, a city located along the bank of Mediterranean Sea. Herophilus (335-255 BC) and Erasistratus (304-258 BC), known as the father of human anatomy and physiology respectively, belonged to this institution[3,4].

Origin and evolution of Unani medicine

The medical knowledge, which originated in Greece by the efforts of Hippocrates and his students around 400 years BC, was later acquired by the Roman Empire. In the 1st century AD, Dioscorides, a renowned physician of Rome, published his remarkable work in pharmacology, which was later translated into Arabic as "*Kitabul-Hashayash*". Medical science later received patronage of the Persian Empire, especially during the reign of Shapur and Nausherwan families. A great many eminent ancient physicians, including Ibn Sina, Raban Tabri, Rustam Jarjani, and Zakariya Razi came from Iran[5-7].

Arabs got familiar with Greek medicine around 600 A.D., i.e., a little prior to the dawn of Islam. In the early 7th century, the healing practices throughout Arabia remained influenced by teachings of the prophet of Islam. For the next 600 years, covering the Umayyad period (AD 660-750) and the Abbasid period (AD 750-1258), medical knowledge of Asia and Europe also enriched the contemporary Arab therapy. Harun Rasheed (786-809 AD) of the Abbasid period set up a huge academic center, called

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Baital-Hikmah (House of Wisdom) in Baghdad, which became a hub of medical education. The conquest of Roman and Persian Empires by Arabs fortified the Greco-Arab medicine in these regions[7-9].

During the 6th to 13th Century AD, medical systems of different regions got mixed with the local healing practices of Arabs and the blend was then identified also as the Arabic medicine or Islamic medicine. The credit of inventing techniques of calcination, distillation, fermentation and sublimation goes to the physicians of this era, who also developed an official formulary (*Qarabadeen*). The eminent physicians like Jabir bin Hayyan (AD 717-813), Ibne Raban Tabari (AD 810-895), Abu Bakar Zakariya Razi or Rhazes (AD 850-923), and Ali Ibn Abbas Majoosi or Haly Abbas (AD 930-994) belonged to this period. Bu Ali Ibn Sina or Avicenna (AD 980-1037), the most prominent scholar and physician of his time, authored his world famous "*Al-Qanoon fit-Tibb*" or (The Canon of Medicine), which stands as the most consulted and maximally translated work on medicine and remained in the syllabi of European medical schools till the 17th century. Abdul-Latif Baghdadi (AD 1163-1231), a famous anatomist, authored over 57 books on diverse aspects of medical science and Ibne Baitar (AD 1197-1248) authored "*Kitab Jameul-Mufradaat*" dealing extensively with medicinal plants and their properties. Ibne Nafees (AD 1210-1288) published his findings pulmonary blood circulation with relevant diagrams much earlier than William Harvey (AD 1578-1657) and authored 24 books besides writing a commentary on Avicenna's *The Canon of Medicine*[3,4,9,10].

Basic philosophy and science of Unani medicine

Greek philosophers Empedocles (504-443 BC), Hippocrates (460-370 BC) and Aristotle (428-348 BC) promoted the 'four-element theory' (*Kullia Arkaan Arba*), which envisaged that fire, air, water and earth (possibly denoting heat/energy, gases, liquids and solids, respectively) are the basic constituents of human body[5]. Some Arab scholars such as Shaikh-Al-Ishraq, considered fire as a form of air itself and hence believed in a three-element theory, while some Indian philosophers added 'sky' as the 5th constituent[11]. Unani physicians (*Hakims*) generally followed the four-element theory. However, in the 17th century, the term 'element' was defined precisely as a material composed of a single type of atoms and now as many as 118 elements stand identified. Therefore, it is no longer justifiable to use the term 'element' for the four basic ingredients of the ancient hypothesis, as each of them is now a mixture of several elements[12,13]. In fact, the confusion arose mainly because the word '*Arkaan*', used by Hippocrates for the basic constituent materials of human body, was translated into English as elements. Now that the meaning of 'element' is well set in a different sense, some alternative expression, like 'basic ingredient' or 'constituent material', needs to be identified to replace the term 'element'.

Modern science has confirmed the presence of 80 elements in the human body, which are classified as 'essential', 'possibly essential' and 'non-essential' elements (Table 1), although the major bulk of tissues consists of carbon, hydrogen, nitrogen, oxygen and sulphur[14,15]. Hakim Abdul Hameed (1908-1999), an eminent Indian physician of the 20th century, who promoted the modern scientific research in Unani medicine, used to believe that any disturbance in the elemental equilibrium of the body for any internal or external reason, fetches disease and causes damage to health[16]. He founded an international society of 'Medical Elementology' and organized international conferences in New Delhi (1983, 1993), Karachi (1987) and Ankara (1989) to discuss the role of trace elements in health and disease.

As per the Unani concept, of the four basic constituents (*Arkaan*) of the human body (viz., fire, air, water and earth), fire is hot and dry, air is hot and wet, water is cold and wet and earth is cold and dry in

Table 1 — The elements present in the human body

Type	Category	Elements	Total number
Essential elements	Major or Bulk	C, Ca, Cl, Fe, H, K, Mg, N, Na, O, P, S	Twelve (12)
	Minor or Trace	Co, Cu, F, I, Mn, Mo, Zn	Seven (7)
Possibly-essential elements	Major or Bulk	Si	One (1)
	Minor or Trace	As, B, Ba, Br, Cr, Ge, Ni, Rb, Se, Sn, Sr, V	Twelve (12)
Non-essential elements		Ag, Al, Au, Be, Bi, Cd, Ce, Cs, Dy, Er, Eu, Ga, Gd, Hf, Hg, Ho, Ir, La, Li, Lu, Nb, Nd, Os, Pb, Pd, Po, Pr, Pt, Ra, Re, Rh, Rn, Ru, Sb, Sc, Sm, Ta, Tb, Te, Th, Ti, Tl, Tm, U, W, Y, Yb, Zr	Forty eight (48)

(Modified from Iyengar *et al*. 1978)

nature[17]. Their diverse combinations give rise to four humors, which determine the so-called 'temperament' (*Mizaaj*) of individuals[18,19]. According to this theory, everything present in the world has its own temperament, which reflects from its functions. The human body, having the best combination of constituent materials also has the best temperament to deliver the finest performance. Unani medicine aims at restoring the normal temperament of the patient in order to get rid of the diseased condition[20,21]. The holistic approach of health management in Unani medicine takes a comprehensive view of structures and functions of human body, hence focuses on (a) the basic ingredients (*Arkaan*), (b) humors (*Akhlaat*), (c) temperament (*Mizaaj*), (d) vital spirit or pneuma (*Rooh*), (e) energies or strengths (*Al-Quwwah*) and (f) organs and their functions (*Al-A'aza wa Af'aal*)[13,22].

As per the Hippocrates' humoral theory, varied combinations of the basic four *Arkaan* give rise to four vital body fluids or humors (*Akhlaat*), identified as red blood (*Dam*), phlegm (*Balgham*), yellow bile (*Safra*) and black bile (*Sauda*). Blood is considered as hot and wet, phlegm as cold and wet, yellow bile as hot and dry, while black bile as cold and dry in nature. Each person is supposed to have a specific mixture of these humors, which then determines his/her temperament (*Mizaaj*). A person may have a choleric (*Safravi*), melancholic (*Saudavi*), phlegmatic (*Balghami*) or sanguine (*Damvi*) temperament when he/she has a predominance of yellow bile, black bile, phlegm or blood, respectively[23]. The concept of humors exists, in a relatively raw form, in the much older systems of Ayurveda and Siddha also[24]. During the early phase of the European renaissance, the humoral theory of disease was criticized as being hypothetical, but in the beginning of the 20th century it became the cynosure of researchers once again[25].

The concept of temperament (*Mizaaj*) is of paramount significance in Unani medicine. According to Ibne Sina, temperament is a state that emerges from the combination of humors and is identified as being choleric (*Safravi*), melancholic (*Saudavi*), sanguine (*Damvi*) or phlegmatic (*Balghami*) in different people. To determine the temperament of a person, 10 comprehensive parameters (*Ajnaas-e-Ashrah*), viz., (1) the touch, (2) muscles and fats, (3) body hair, (4) body colour, (5) body stature, (6) quality of organs' passiveness, (7) sleep and wakefulness, (8) bodily functions, (9) body excreta, and (10) psychic reaction, are taken into consideration[11]. In the recent past, William Sheldon (1898-1977), an American psychologist, proposed a similar concept and, based on some physical characteristics of human body, classified humans into three categories (somatotypes). He held that people are born with an inherited body type, which is based on their skeletal frame and correlates to their temperament. On the basis of 10 anthropometric parameters, he identified three basic body types - ectomorph, mesomorph and endomorph – and proposed that people represent combinations of these basic body types[26]. The theory was later criticized by the subsequent workers. Mulla *et al*.[27] found enormous similarity between the Unani concept of temperament and the Sheldon's concept of somatotypes.

The concept of pneuma (*Rooh*) in Unani medicine looks a little ambiguous and is often confused with soul and psyche. The term '*Rooh*' means a vehicle of the stimulating force (*Nafs*) responsible for all the sensuous and voluntary actions of the human body. However, Galen (AD 129-216) considered *Rooh* as a part of the atmospheric air that goes to heart via lungs; so here it appears to be something equivalent to oxygen[28].

The ancient Unani scholars held that the commencement and maintenance of functions vital for life require a sort of energy/strength. They identified (a) natural strength (*Quwwate Tabiyah*), (b) psychic and mental strength (*Quwwate nafsania*), and (c) vital strength (*Quwwate haywaniya*) inherent in all human beings to maintain their life and the ability to reproduce. These strengths, selectively associated with different organs, enable them to perform their specific functions[29] and create two unique states called *Nafs* (a stimulating urge) and *Tabiyat* (a potential to maintain equilibrium). The word '*Tabiyat*' was used by Arab philosophers as a synonym of the Aristotle's '*Physis*', which denoted 'natural faculty', a God-gifted power for equitability of the body, which works automatically for the welfare of the human body and makes for every motion and rest[30,31]. Galen regarded *Tabiyat* as the potential to resist any deterioration in the natural state of the body by causing appropriate changes. Thus, it considerably resembles the 'immunity' of the modern medical science[28]. *Nafs* (anima), the innate stimulant for all sorts of motion and related activities, often modulates *Tabiyat* for initiating an action[32]. However, explanation of these two potentials of the body is often overlapping in the literature, leaving enough to be desired.

Various organs (*Al-A'aza*) related to different biological systems such as the dermal, digestive, reproductive, circulatory, urinary and nervous systems in the body, and the diverse functions (*Al-Af'aal*) of these organs were described well by the ancient physicians[11,13]. Their crude observations and inferences have been duly refined and improved by the present-day scientific research on human anatomy and physiology. Information is now available up to the molecular level to rejuvenate the traditional concepts. According to Unani physicians, blood may be normal (scarlet red or dark red, odorless, alkaline, with moderate viscosity) or abnormal (blackish, yellowish or whitish red, acidic, with altered viscosity and bad odor). Normal blood with all humors in normal proportion in terms of quantity and quality, ensures the normal temperament of all organs, which is indicative of health[33,34].

The ancient Unani scholars regarded liver to be the main seat for most of the metabolic functions. Modern research reveals that many chemical substances, regulating hematopoiesis **(**production of blood cells from the precursor stem cells), are directly/indirectly produced in liver[35]. In fact, hematopoiesis occurs prenatally in the yolk sack, then in the liver and lastly in the bone marrow. Liver is also the major site of thrombopoietin (Tpo) production, which has a positive correlation with the level of platelets[36]. The ancient physicians also held that blood contains fine parts (*Akhlaat-e-Lateefa*) and coarse parts (*Akhlaat-e-Katheefa*) of humors, which may possibly be equated with the liquid (plasma) and the cellular (RBCs, WBCs and platelets) components of blood. They believed that blood coagulates and that the intravascular clotting can be prevented by the intervention of *Tabi'at* or the structure of vessels[37]. Modern science has identified the presence of certain vasoactive hormones (nitric acid and prostacyclin) that relax blood vessels and inhibit platelet activation, thus preventing the intravascular coagulation of blood[38]. So, much of what we know about blood today with the help of advanced analytical means, was realized by early physicians merely through observation and experience.

Principles of disease management

The Unani system considers human as an integral part of the cosmos, wherein a bio-socio-psychological equilibrium represents health, and any disturbance in this "whole" indicates disorder[28]. Diseases are supposed to develop because of (a) internal causes such as ill temperament or structural malformation of organs/tissues, or (b) external causes such as environmental impacts or microbial interventions. These causes are influenced by (a) atmospheric air, (b) water and food, (c) sleep and wakefulness, (d) excretion/retention of body wastes, (e) physical movements and repose, and (f) mental movements and repose[17]. Thus, human diet, psychology, physiology, ecology and life style are supposed to determine the human health[39]. The equilibrium of humors, which represents healthy state of human body, depends on a subtle balance among these factors. Any imbalance of humors caused by thinning/thickening of their consistency, or by their over-activity or putrefaction leads to the incidence of disease[13,24].

Unani physicians consider the entire personality of the patient for the purpose of diagnosis. Having understood the patient's temperament, diagnosis is confirmed by pulse reading. During the state of disease, several signals indicating the specific body conditions or internal milieu are said to float in the pulse, making it a jerking, wavy/undulant, vermicular, serrate, intermittent, spasmodic, tense, tremulous, double-stroke, ant-like or hammer-like pulse. Diagnosis may be endorsed further by examining the urine and stool[40]. Accurate pulse reading is, of course, a difficult task. Unfortunately, this art is dying gradually, and only a limited number of perfect pulse readers are left[28].

The basic tenet of treatment in Unani therapy is the principle of contrast, suggesting the treatment of an ailment caused by the abnormal quality/quantity of humors, with the drug of opposite qualities (*Ilaaj bil Zid*). In case the organ remains sluggish even after restoration of normal temperament, it is potentiated with tonics and rejuvenating drugs. Unani treatment is normally classified into Dietotherapy (*Ilaaj bil Ghiza*), Pharmacotherapy (*Ilaaj bid Dawa*), Regimental therapy (*Ilaaj bit Tadbeer*), and Surgical therapy (*Ilaaj bil Yad*)[29]. Dietotherapy is based on dietary management for maintaining health and improving body resistance or to get rid of diseases. Pharmacotherapy normally makes use of natural drugs, mostly the herbal ones. Regimental therapy is used to remove morbid materials from the body or divert them from vital organs (like brain, heart and liver) to other body parts of lesser activity. It includes a variety of exercises and procedures including

purgation (*Ishaal*), emesis (*Qai*), diuresis (*Idraar*), cupping (*Hijamah*), massage (*Dalak*), exercise (*Riyazat*), enema (*Huqna*), irrigation (*Nutool*), inhalation (*Inkabaab*), expectoration (*Tanfees*), fomentation (*Takmeed*), diversion (*Imala*), cauterization (*Amal-e-kai*), diaphoresis (*Tareeq*), venesection (*Fasd*), Turkish bath (*Hammaam*), foot-bathing (*Pashoya*) and leeching (*Irsal-e-alaq*)[28]. Surgery is applied in rare cases, when it becomes unavoidable.

Temperament-based therapy

As per the concept of temperament (*Mizaaj*) in Unani medicine, every individual has some unique features depending on his/her morphological, psychological and physiological conditions[41]. The temperament may be inherent, i.e., governed by a person's genotype and phenotype (metabolism, behavior, mental status), as well as acquired, i.e., modulated by his/her environment and life style[42]. Avicenna proposed the concept of temperament-based therapy some 1000 years ago, and said that a medication may exhibit different effects on different bodies, on different organs of a person, or on the same organ at two different time points[43]. This concept has some resemblance with the modern concept of precision or personalized therapy, wherein the pharmacokinetics, pharmacodynamics and efficacy of the drug are influenced by the genetic as well as environmental factors[28]. The resemblance lies in the basic assumption that all individuals do not have the same temperament and therefore respond to a given medicine differently.

The ancient *Hakims* also held that the temperament of herbs is influenced by the climatic and geographical conditions of their native place and by the environment of the region where these are cultivated or grow wild. Modern studies have endorsed these assumptions by showing that the quality and quantity of secondary metabolites in plants are affected by the habitat environment, including the soil characteristics. The amount of active ingredients responsible for the therapeutic efficacy thus varies with plant genotype and habitat ecology[44,45]. For instance, *Artemisia annua,* known for its activity against the cerebral malaria, showed a marked variation in its artemisinin content with reference to varied agro-climatic conditions. Analysis of samples from different regions of the world revealed the maximum (about 0.42 and 0.50%) artemisinin content in plants grown in Malaysia, the minimum (0.0I - 0.09%) in those from India, and merely in traces (i.e., negligible) in those from Belgium[46].

Evolution of Unani medicine in the Indian sub-continent

Around the middle of the 14th century, when Mongols attacked the Central Asia and Persia, many experts of Unani medicine fled to India. Under the patronage of Delhi Sultans (the Khiljis, the Tughlaqs) and Mughal Emperors, they promoted the Unani art of healing among Indian masses, who preferably called it *Tibb-e-Unani* or *Hikmat*[6,9,47]. Eminent physicians of that period included Zia Mohd Masood Rasheed Zangi, who was active during the reign of Tughlaq dynasty. His book "*Majmooa-e-Ziaee*", published in the year 1313, encompassed the diverse disciplines of medical science. Shahab Abdul Karim Nagauri published his "*Tibbe-Shahabi*", dealing with fundamentals of Unani as well as Ayurvedic systems of medicine, in 1388. The book "*Dastoorul-Atibba*" by Abul Qasim Farishta (AD 1525-1623) spoke too high of his deep understanding of Unani and Ayurveda. Ali Gilani (AD 1554-1609), a court physician of Akbar the Great, published several books that earned him great fame. S.M. Hashim Alvi Khan (AD 1669-1749) wrote 16 excellent books on Indian healing systems. Azam Khan (AD 1813-1902), a famous Unani physician during the British rule in India, wrote "*Ikseer-e-Azam*" and "*Muheet-e-Azam*" which have a distinguished place in the Unani literature even today. M. Kabiruddin (AD 1889-1976) translated 88 Unani books of Arabic and Persian languages into Urdu. The present curricula of several Unani colleges in the Indian sub-continent are based on the precious literature produced by him[7,9,48,49].

Tibb-e-Unani suffered a setback during the British rule due to withdrawal of State patronage. However, contributions of Sharifi family of Delhi, Azizi family of Lucknow, Usmani family of Allahabad and the patronage of Nizam of Hyderabad and later the efforts of two sons of the Hamdard family in Delhi could ensure the survival of *Tibb-e-Unani* during the British and post-British periods.

The Sharifi family of Delhi produced several shining stars in the Tibbi world. For instance, M. Sharif Khan (AD 1725-1807), famous for curing complex and incurable ailments, authored nine books and several monographs, each focusing on a single disease and its treatment. Mahmood Khan (AD 1819-1891), known for treating the sexual and reproductive ailments, wrote two books on these aspects and started a Unani School in Delhi. Ajmal Khan (AD 1863-1927), famous for his expertise in pulse reading and diagnosis, established 'Hindustani Dawakhana', a Unani pharmaceutical company in Delhi (1905),

which, in due course of time, took patents for 84 herbal formulae. He got Asrol (*Rauwolfia serpentina*) analyzed to isolate its various alkaloids such as ajmalin, ajmalacin, ajmalanin and reserpine, which gave a highly efficacious drug for lowering hypertension. He founded All India Vedic and Unani Tibbi Conference (1906) to resist the harsh behaviour of British rulers towards the Indian systems of medicine and set up in Delhi a Unani College for female students (1911) and a general college of Ayurveda and Unani (1916). In 1920, he founded a Council to improve the Unani syllabi and inculcate the tendency of research and innovation in the subject[7,9,47].

The Azizi Family of Lucknow produced several famous Unani physicians including Abdul Azeez and Abdul Latif Falsafi. Abdul Azeez (AD 1855-1911) set up, in 1902, the Takmil-ut-Tibb College of Unani medicine in Lucknow. He specialized in curing ailments with single-drug treatment. Abdul Latif Falsafi (AD 1900-1970) was much appreciated for his book *Kitabun-Nabz*, and his Urdu translation of Avicenna's monograph, *Advia Qalbia*[7,47,50]. The Usmani family of Allahabad also produced great champions of Tibb-e-Unani including Ahmad Husain Usmani and Hammad Ahmad Usmani during the 20th century. They started a Unani Medical College and Hospital at Allahabad[7,47].

Hamdard, currently the biggest Unani pharmaceutical company in the Indian sub-continent, was started in Delhi by Hakim Abdul Majeed (AD 1883-1922) in 1905. His elder son, Abdul Hameed (AD 1908-1999), established Jamia Hamdard (Deemed to be a University) in Delhi (1989), while the younger son, Mohammad Said (1920-1998) set up Hamdard University in Karachi (1985), both with specific mandate to promote education and training in Unani medicine[51,52]. Both the brothers produced enormous authentic literature on herbal medicine. Abdul Hameed also undertook the project of English translation and annotation of Avicenna's *Al-Qanoon fit-Tibb*. Following the modern clinical protocols, he developed some highly effective drugs to treat hypertension, cholesterol deposition, liver disorders, and renal disfunction. *Rooh Afza*, a relaxing and energizing beverage of Hamdard Laboratories is now popular globally[53,54]. In recognition of his contribution to health and education sectors, the Government of India conferred upon Hakim Abdul Hameed the *Padam Shri* (1965) and *Padam Bhushan* (1991) awards. He also received awards and honors from various other nations including the erstwhile USSR, Iran, Pakistan and Turkey[52,55]. His younger brother, Hakim Mohammad Said, got the alternative medicine recognized by the World Health Organization (WHO) and wrote numerous books on herbal medicine[56].

Unani medicine in India today

For the last few centuries, India has been the exclusive portal for the progress of Unani medicine, which is no longer in vogue in the European or Arab nations. The present day *Tibb-e-Unani*, an outcome of interaction of Greco-Arab medicine with several other medicinal systems from Asia, Africa and Europe, is now an Indian system of medicine[57]. It bears similarities, both in theory and practice, with some other systems of Indian medicine, particularly with Ayurveda[58] (Table 2).

The first formal teaching of Unani medicine was started in the Oriental College of Lahore in 1872. Later, many famous Unani colleges sprang up during the 20th century and now there are over 55 recognized colleges of Unani education in India. They offer a graduation course (BUMS) in Unani medicine and some of these also conduct post-graduate (MD, MS) programs in different disciplines of the subject[59]. In 1984, Govt. of India established a National Institute of Unani Medicine in Bengaluru, which became functional in 2004. There are over 51,000 registered Unani physicians in India, while many unregistered Hakims also practice in the rural areas. There are 262 Unani hospitals and over 1620 Unani dispensaries managed by the government as well as private organizations[60]. Formal education of Unani medicine, leading to the award of a diploma/degree has now transgressed the boundaries of Indian sub-continent and gained the ground in countries like China, Sri Lanka, England and South Africa. Many people in Australia, Canada, France, Germany, Japan, Malaysia, USA and some South American countries now use the herb-based Unani products as nutraceuticals or complementary medicated stuffs[61]. Of late, interest in traditional Indian medicine has grown in Turkey and several African nations such as Algeria, Cameroon, Ethiopia, Ghana, Guinea, Mauritius, Morocco, Senegal and Uganda[62-64].

Certain Government agencies such as the Central Council of Indian Medicine (CCIM) and the Central Council for Research in Unani Medicine (CCRUM),

Table 2 — A comparative look at three major systems (Ayurveda, Siddha and Unani) of Indian medicine

Ayurveda	Siddha	Unani
ORIGIN		
India (before 500 BC)	India (5000 BC)	Greece (460-377 BC)
CURRENT ABODE		
India	South India	Indian sub-continent (India, Bangladesh, Pakistan)
PHILOSOPHY		
Human composition is in equilibrium with Nature, indicating health; any disturbance causes disease.	Human composition is in equilibrium with Nature, indicating health; any disturbance causes disease.	Human composition is in equilibrium with Nature, indicating health; any disturbance causes disease.
HUMORS (VITAL FLUIDS)		
Human body contains three humors (Doshas), namely, *Vata, Kapha, Pitta*	Human body contains three humors (Mukkuttaram), viz., *Vattam, Kapham, Pittam*	Human body contains four humors (Ikhlat) called *Dam, Balgham, Safra, Sauda*
DRUG CHARACTERISTICS		
Mainly plant based, free from side effects	Based on minerals and oils, no side effects	Mainly plant based; free from side effects
PRINCIPLE OF TREATMENT		
Cleansing of digestive system	Cleansing of digestive system	Cleansing of digestive system
REGIMENTAL MODES OF THERAPY		
Five (Emesis, Purgation, Enema, Nasal insufflation, Bloodletting)	Four (Emesis, Purgation, Enema, Nasal Drops)	All those in Ayurveda plus some others like Massage, Bathing, Cupping, Leeching & Diaphoresis

supervise, regulate and promote the education and research in Unani medicine[59]. Institutional network of CCRUM now comprises of 12 Research Institutes 09 Research Centres/Units, 02 National Institutes, a Unani Medical College, and a few research laboratories The CCRUM-sponsored research has led to significant findings with reference to infective hepatitis, vitiligo, rheumatoid arthritis, psoriasis, filariasis, bronchial asthma and hyperlipidaemia. Pharmacopoeial standards have been developed for about 300 single drugs and 200 compound formulations. In collaboration with WHO, the Council has developed 'Standard Unani Terminology' encompassing some 4000 terms used in the Unani system of medicine and is trying to develop 'Standard Morbidity Codes' for different diseases as a part of the Health Information Management System[59]. Future plans of the Council also look promising[65].

Does Unani medicine require an evidence base?

Evidence-based medicine (EBM) stands on evidence coming from the data generated through a well-designed and well-conducted research and integrates the clinical activity and patient's status with research findings. New evidence from research may approve or discard the long-existing and accepted methods or offer new alternatives that are more accurate, effective and with less adverse side effects. The question arises if an evidence base is essential even for a system that has been effectively operative in larger part of the world for thousands of years with a bright history of positive outcome. The immediate reply comes in the negative, but a wise opinion should not lose sight of the extended benefits of putting evidence in support of even a traditional system, so that it becomes well equipped to compete with modern systems and grow as a contemporary science. The Unani medicine requires a specifically-designed research (a) to re-validate its fundamentals in order to make them look more convincing, (b) to standardize its procedures of treatment, (c) to explore better treatment modalities for the existing and the newer diseases, (d) to develop the dose, duration, indication and side-effect profiles for Unani medicine, and (e) to evaluate the possible interactions of Unani and modern medicines[66]. To the satisfaction of the followers of Unani medicine, efforts have been initiated to move forward in these directions[67-71].

'Randomized Controlled Trials' has been the maximally used design of study in biomedicine, but a traditional system of medicine, which relies on multifactorial packaged interventions, requires slightly modified study designs based primarily on observational surveys/studies, which fit better to its medical epistemology[72]. The 'Whole System Research' looks promising to evaluate the comprehensive clinical interventions of Unani medicine, as this approach not only identifies the

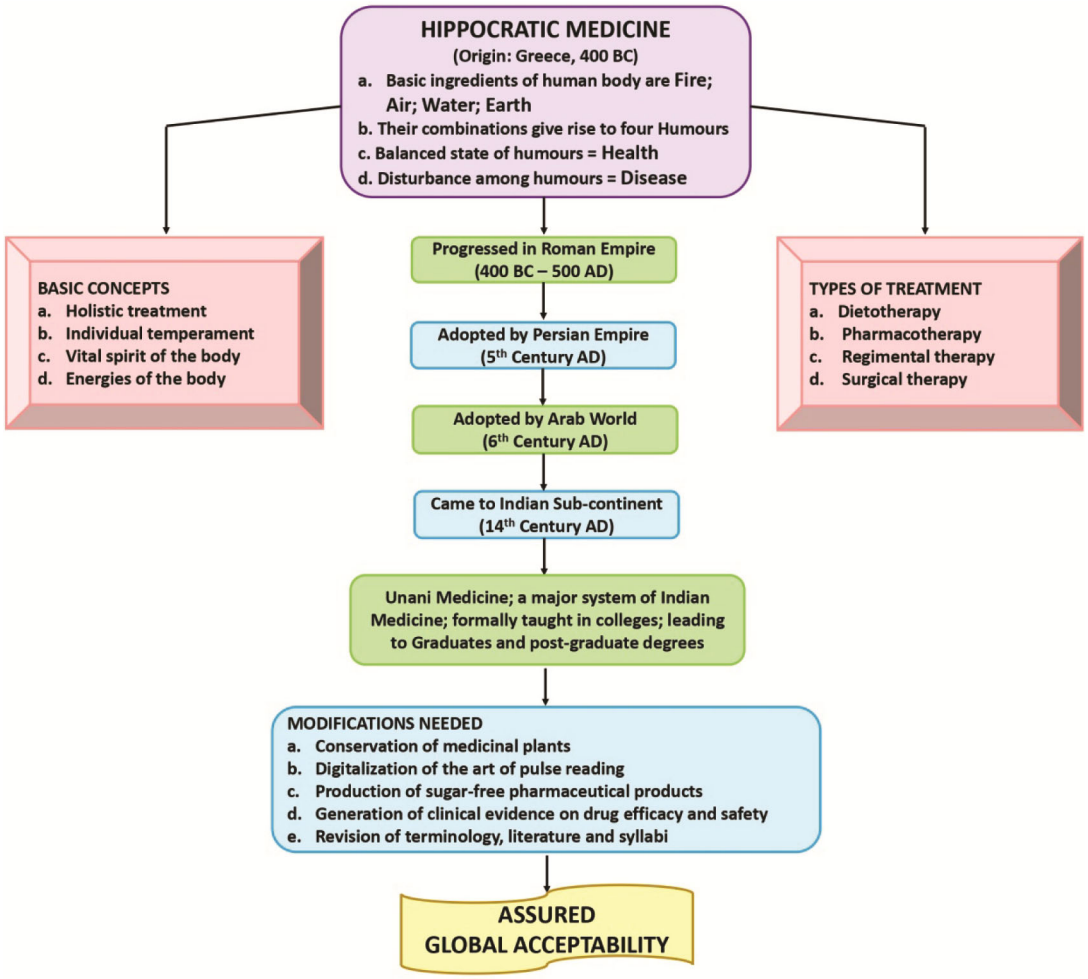

Fig. 1 — Schematic presentation of the main characteristics of Unani medicine and the major milestones of its history of evolution

multiple variables involved but also explores the mutual relationship between these variables and considers the multiple targets of intervention[73]. So, the evidence base for Unani medicine may be built using (a) 'Retrospective Treatment Outcome Survey', based on generation of clinical data such as the patient's status and progress after using the Unani medicine; (b) 'Comparison of Prognosis and Outcome', which explores whether the healthcare dispensed by Unani practitioners is comparable to the outcome expected of the modern medicine; (c) 'Dose-escalating Prospective Study', which determines the level of specific activity at different doses; (d) 'Reverse Pharmacology', which integrates documented clinical experiences and experimental results into leads, and converts them into drug candidates through pre-clinical and clinical research; and (e) 'Pharmaco-epidemiology', which examines drug toxicity and efficacy in large populations, thus providing evidence in support of a system known to be safe[74-78].

Figure 1 elucidates the main characteristic features of Unani medicine and presents a bird-eye view of its past, present and future.

Conclusions, Criticism and Suggestions

The Unani system of medicine, which originated in Greece nearly 2400 years ago, came to India in the 14th century after availing the patronage of Persian and Arab Empires for about 700 years. It considers human body as a product of four basic ingredients, which combine to produce four humors. These humors then determine the temperament of an individual; their natural equilibrium represents health and any disturbance in their balance causes disease. The Unani treatment fetches a permanent cure of ailments rather than a short-term symptomatic relief, and shows negligible adverse effects, if at all. It takes

into account the individualistic temperament of the patient and also of the drugs used. The modern concept of personalized medicine seems to have some resemblance with the age-old concept of personal temperament in Unani medicine.

Due to repeated inter-language translations of the literature of Unani medicine during its 2400-year long journey from Greece to India, some discrepancies have crept in the description of some of its basic definitions/concepts, possibly due to difference in (a) application of grammar and/or (b) selection of words while translating the text from one language to another.

The ancient concepts of traditional systems (such as Ayurveda, Unani and Siddha), drawn from crude observations, may now be re-visited for a possible refinement, wherever required, in the light of new knowledge available. Description of some old hypotheses of Unani medicine, such as those regarding pneuma, blood composition, *Mizaaj*, *Tabiyat*, *Nafs*, etc, may be suitably re-phrased to render these concepts more easily understandable and acceptable by the present generation. Syllabi for different teaching programs must be revised to remove obsolete topics, if any.

The exercise of standardization and characterization of single and compound Unani drugs, which is based mainly on microscopic analysis of morpho-anatomical characters of plants, often supported by chromatography and spectroscopy, should also include DNA fingerprinting and chemical profiling of plants. Preservation of threatened or endangered medicinal plant species deserves special attention. The vaguely known pharmacokinetics and pharmacodynamics, and the non-availability of data on drug-to-drug and food-to-drug interactions, which often disappoint a patient of modern mindset, must be undone by conducting more pre-clinical and clinical studies aimed at elucidating the mechanism of Unani drugs. Abundant use of sugar in traditional Unani formulations renders them unusable for diabetics. The newly started trend of manufacturing such products in the form of sugar-free powder, tablet or capsule is, therefore, promising.

Another issue of deep concern is the fast-depleting art of pulse reading, which has hitherto been a hallmark of Unani medicine. The number of *Hakims* proficient in pulse reading has drastically reduced in the recent past. Institutions involved in promoting Unani medicine can initiate a collaborative project, involving the available pulse readers and the experts of electronics/digital technology, to convert the pulse signals into spectral form. These spectra (representing the varied pulse modes), along with their interpretation produced by expert Hakims, may be preserved in electronic memory so that even in the absence of such Hakims, the pulse of the patient may be matched with these spectra to draw conclusions based on their interpretation available.

Efficacy of Unani medicine stands established by its successful treatment of diverse categories of patients for thousands of years, but the modern mind demands scientific evidence for efficacy and safety of drugs to be used. Data collection on the outcomes of Unani treatments should preferably be made through observational studies, factorial designs and preference trials. Application of reverse pharmacology and pharmaco-epidemiology can generate reliable data on aspects of bioavailability, mechanism, epigenetics and safety of drugs.

Since the environmental factors and pollutants also affect the growth and yield of medicinal plants and even the quantity and quality of secondary metabolites, decisions regarding the dosage of drugs, duration of drug-use against the acute and chronic disorders, and the shelf life of single and compound drugs deserve a careful examination. Techniques of regimental therapy may also be testified for their efficacy and safety. Having done this all, Unani medicine has the potential to emerge as the first and the preferred choice of all those confronted with health problems all over the globe.

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Conflict of Interest

The authors have no conflict of interest to disclose.

Authors' Contributions

AP and MA: Conceptualization, literature review, writing of original draft; BP and RP: Resources, software, literature review; MI: Supervision, reviewing and final editing.

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