

## Editorial

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# Medicine and Nephro-Urology in Ancient Iran

Masoumeh Mohkam MD\*

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Pediatric Infectious Research Center, Pediatric Nephrology Research Center,  
Shahid Beheshti Medical University, Tehran, Iran

### \*Corresponding Author

Masoumeh Mohkam  
Mofid Children's Hospital, Tehran-Iran  
E-mail: [mohkam@pirc.ir](mailto:mohkam@pirc.ir)  
Telefax: +98 (21) 22227033

The practice and study of medicine in Persia has a long history. The history of medicine in Iran is as old and as rich as the Persian civilization. In the sixth book of Zend-Avesta (the primary collection of sacred texts of Zoroastrianism), science and medicine rise above class, ethnicity, nationality, race, gender, and religion. The Avesta contains some of the earliest records of ancient Iranian medicine.

### Ancient Iranian Medicine

Most of the last chapters of the Vendidad (559–330 BC), one of the surviving texts of the Zend-Avesta, are devoted to medicine. It distinguishes three kinds of medicine: medicine by the knife (surgery), medicine by herbs, and medicine by divine words [1]. The Avesta mentions several medicinal herbs including basil, chicory, sweet violet, and peppermint. Avestan texts list not only the various parts of plants such as the root, stem, scale, leaf, fruit, and seed used for treatment, but also indicate which plant is the remedy for each disease. It also mentions several notable Iranian physicians like Mani, Roozbeh, and Bozorgmehr. The ancient Iranian academic centers like Jundishapur University (3<sup>rd</sup> century AD) were a breeding ground for the union of great scientists from different countries and civilizations [2,3]. These centers successfully followed their predecessors' theories and extended their scientific research through history. The first

teaching hospital was the Academy of Jundishapur in the Persian Empire in Iran. In this center, students practiced on patients under the supervision of physicians. Some experts go so far as to claim that "the credit for the whole hospital system must be given to Persia" [4].

Evidence of cranial surgery dates back to the 3<sup>rd</sup> century BC, when the first cranial surgery was performed in the Shahr-e-Sukhteh or the Burnt City (a 5000-year-old city) in Sistan and Baluchistan, southeast of Iran [5]. The archaeological studies on the skull of a 13-year-old girl suffering from hydrocephaly indicated that she had undergone cranial surgery and the patient lived for at least about 6 months after the surgery [6,7]. It is the earliest evidence of skull surgery ever found on earth. The variety of finds at the Shahr-e-Sukhteh continues to shock the world. Archaeologists have even discovered the oldest known artificial eyeball, as reported by the Cultural Heritage News Agency, in this city. The surface of the artificial eye is covered with a layer of gold, engraved with a central circle, representing the iris, and gold lines patterned like sun rays. It is a 5000-year-old female skeleton wearing an artificial eyeball [8].

The Iranian science was interrupted due to wars and the invasions of the other countries. Many schools, universities, and libraries were destroyed and books were burned. Nevertheless, the Iranian science resurfaced during the Islamic period. Some Iranian Hakims (practitioners) such as

Muhammad ibn Zakariya al-Razi, known to the West as Rhazes (865-925 AD), and Ibn Sina, known as Avicenna (980-1037), were responsible for accumulating all the existing information on medicine of the time. They also expanded this knowledge by their own astute observations, experimentation, and skills [4].

The famous Iranian scientist and philosopher, Avicenna, continued for centuries to have a great influence on the medical knowledge of the world by writing the Canon. "Qanoon fel teb of Avicenna" or "The Canon" and "Kitab al-hawi of Razi" or "Continens" were reference texts in the western medical education from the 13<sup>th</sup> to the 18<sup>th</sup> centuries [9,10]. The Canon (Fig. 2) was the reference for medical schools in Europe up to the 17<sup>th</sup> century AD. The Canon ranks among the most famous books in the history of medicine. In The Canon of Medicine (c. 1025), Avicenna described numerous mental conditions, including epilepsy, paralysis, stroke, vertigo, tremor, hallucination, nightmare, insomnia, mania, and dementia. The Canon is an encyclopedia containing more than one million words [11,12].

Razi is considered the father of pediatrics and a pioneer of neurosurgery and ophthalmology. He discovered and refined the use of ethanol in medicine. Numerous "firsts" in medicine, clinical care, and chemistry are attributed to him, including being the first to differentiate smallpox from measles, and the discovery of numerous compounds including alcohol and kerosene [1,13,14].

Abu Nasr Farabi, also known in the West as Alfarabius (872-951 AD), is noted for his contributions to psychology; he wrote the first treatises on social psychology.

In the 10<sup>th</sup> century work of Shahnameh, Ferdowsi (Hakim Abul-Qasim Ferdowsi Tusi, most commonly known as Ferdowsi, was a highly revered Persian poet who is the author of the Shahnameh) describes a caesarean section performed on Rudaba, during which a special wine agent was used as an anesthetic [9,10]. Although largely mythical in content, the passage shows working knowledge of anesthesia in ancient Persia.

In the 14<sup>th</sup> century, the Persian language medical book Tashrih al-badan (Anatomy of the Body), by Mansur ibn Ilyas (c. 1390), contained comprehensive diagrams of the body anatomy like the nervous and circulatory systems [15]. These outstanding scholars are among the many whose names will shine in the history of medicine and science and will always be revered by the Iranian

people. Avicenna started his education with Quran (The holy book of Muslims). At a very young age, he acquired good knowledge of Quran. Then, he began studying philosophy by reading various Muslim, Greek and other books on this subject [16].

## Ancient Iranian Nephro-Urology

Avicenna provided valuable information on medicine and the subjects related to nephro-urology. He explained the 2-stage function of the bladder (filling and emptying stages), bladder physiology and intravesical pressure stability and described the bladder layers and strength of the urothelial layer, which was later proved to be due to the tight junctions. He also pointed to the intramural ureter and its antireflux mechanism and the semiology, epidemiology, and treatment of bladder calculi meticulously [17].

Avicenna dedicated a chapter of his book (the Canon) to blood pressure. He discovered the causes of bleeding, and concluded that hemorrhage could be induced by high blood pressure due to the high levels of cholesterol in the blood. This led him to investigate several methods of controlling blood pressure [18]. Review of historical literature shows that Avicenna used the herbal drug 'Zarnab' (*Taxus baccata* L.) as a blood pressure and cardiac remedy. It was recently demonstrated that 'Zarnab' possessed calcium channel blocking activity. So, it is evident that Avicenna used a drug with calcium channel blocking activity much earlier than the arrival of synthetic drugs [19]. Avicenna described a protective role for sports and physical activity in the prevention of coronary obstruction and hypertension [20]. Avicenna wrote a complete section about renal calculi in his book. Totally, 65 herbal, 8 animal, and 4 mineral medicines are mentioned in the Canon of Medicine as beneficial drugs for destructing and preventing renal calculi. Today, using Avicenna's ideas helps scientists to choose better drugs with a historical background to reduce the cost of therapies in patients [21]. Avicenna proposed that constipation could be a risk factor for kidney calculi [22,23].

Avicenna also explained oliguria in his book and mentioned that it could be due to the following causes: drinking inadequate liquid, body porosity, effect of the diarrhea on the body, disability of the kidneys resulting in impaired absorption of fluids, and disability of the liver in separation of the fluid

and sending it to the kidneys. He also made recommendations for the management of oliguria in his book [24]. Avicenna succinctly summarized the changes of urinary color and appearance in his introductory remarks on uroscopy: "While urine color witnesses the quantity of ingested food and drink, it is a sign of bad digestion, cold, phlegm, restlessness, or hepatic obstruction [25].

The book "Hidayat al-Muallimin fel-Tibb (Learner's Guide to Medicine)" was written by Abubakr al-Akawayni al-Bokhari in the closing decades of the 10th century. Written in Persian, this book was dedicated to his son and his students of medicine. Some sections of the Hidayat are about the kidney and the urinary tract and their diseases. These early writings provide insight into the health care of patients with kidney disease [26].

It is really noteworthy that several centuries ago, Iranian physicians described medical problems in their papers and books in a modern stile.

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