
History of Medicine

A Tribute to Zakariya Razi (865 – 925 AD), An Iranian Pioneer Scholar

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Abstract

The resurgence of Islamic Civilization in the Near East in the 7th century AD and its expansion to Persian Empire and Westward provided opportunities of access Persian, Hellenic, and Roman writings in philosophy and medicine. Based on their observations and experiences, Islamic physician-philosophers expanded upon those writings and at times challenged them. Among these physician-philosophers admiring and challenging Galen was Zakariya Razi described as the greatest physician of Islam and Medieval Ages.

A search of electronic and written materials about early Islamic Medicine was carried out focusing on Persian physician-philosophers Zakariya Razi.

Abu Bakr Mohammad Ibn Zakariya al-Razi, known in the West as Rhazes, was born in 865 AD in the ancient city of Rey, Near Tehran. A musician during his youth he became an alchemist. He discovered alcohol and sulfuric acid. He classified substances as plants, organic, and inorganic. At age 30, he undertook the study of medicine. He was a prolific writer with more than 184 texts in medicine attributed to him with 40 of them currently available. Among them are Kitab al-Mansoori, Kitab al-Hawi, and Kitab al-Judari wa al-Hasabah. The latter is the first scientific description for the recognition and differentiation of smallpox and measles. The Bulletin of the World Health Organization of May 1970 pays tribute to Razi by stating "His writings on smallpox and measles show originality and accuracy, and his essay on infectious diseases was the first scientific treatise on the subject". Razi established qualifications and ethical standards for the practice of medicine.

Zakariya Razi was not only one of the most important Persian physician-philosophers of his era, but for centuries his writings became fundamental teaching texts in European medical schools. Some important aspects of his contributions to medicine are reviewed.

Keywords: History of medicine • Iran • Razi

Introduction

From antiquity to the modern era, infectious diseases have played a significant role in determining the course of human civilization. Written records and paleopathologic evidence reveal the lasting impact of infectious diseases caused by viruses, bacteria, spirochetes, and parasites have had on human history. At the present time, the infectious diseases with the greatest impact on humans in the developing countries are tuberculosis, malaria, and human immunodeficiency virus (HIV), while sexually transmitted diseases, HIV, and nosocomial infections are among the most significant in the industrialized countries of the world.

A review of historical evidence strongly supports the significance of two specific exanthemata in any number of epidemics described in ancient civilizations. Descriptions resembling smallpox appear in the earliest Egyptian, Indian, and Chinese writings.¹ The mummy of Pharaoh Ramses V reveals that an acute illness was the probable cause of his death at age 40 in 1157 BC. The Pharaoh was described as having a striking rash of yellowish blisters and pustules which closely resembles smallpox.¹⁻³ Some believe that the plague of Athens, starting in 430 BC, as described by Thucydides, was probably due to the effects of a smallpox epidemic.⁴ Similar to

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smallpox, measles appears to have existed since antiquity. Like smallpox, the origin of measles is not clear.⁴ Introduced by colonizers to the New World, smallpox and measles caused epidemics with devastating effects upon the immunologically naïve native population. These two highly contagious diseases were difficult to differentiate during the early stages as the skin rash and fever are common to both.⁵ The first clear description and distinction between the two diseases, the differential diagnosis and noting the complications of these illnesses, was provided by the Persian alchemist-physician-philosopher Zakariya Razi.^{6,7}

Zakariya Razi

Abu Bakr Mohammad Zakariya al-Razi (Persian Razi, Latin Rhazes), a versatile physician-philosopher or Hakim, was born in 865 AD in the ancient city of Rey, a provincial capital of The Samanid Dynasty, near the present city of Tehran, Iran. He died there in 925 AD, although some scholars suggest he was born in 864 AD and died in 930 AD. He is best known for his contributions to alchemy, medicine and philosophy, ethics in medicine, and metaphysics and authored 184 books and treatise on these subjects. Razi was well-versed in the ancient Greek language and he was an admirer and critic of Galen. There is little information regarding Razi's early life, but it is written that he played lute in his youth and wrote an encyclopedia of music.⁸ Unable to make a comfortable living with music, he changed his interest to alchemy. As a genuine chemist and physicist, he performed a great deal of research and laid the foundation for scientific chemistry to replace alchemy, having written several books and treatise in the field.⁹ He discovered and purified alcohol (ethanol) and pioneered its use in medicine. Also, he is credited with the discovery of sulfuric acid, the "work horse" of modern chemistry and chemical engineering. The discovery of ammonium chloride and other acids are also attributed to Razi. His achievements are particularly important in the history of chemistry for his systematic classification of chemical substances, chemical reactions, and the apparatus used in his laboratory. In two important books, *Kitab al-Asrar* (The Book of Secrets) and *Sirr al-Asrar* (The Secret of Secrets) he classified matter into three categories as of plant, animal, and mineral origin. When asked if he had obtained the knowledge of turning iron and copper into gold, he replied with heretofore not described appreciation

of the limits of scientific chemistry: "I understand alchemy and I have been working on the characteristic properties of metals for an extended time. However, it still has not turned out to be evident to me, how one can transmute gold from copper. Despite the research from the ancient scientists done over the past centuries, there has been no answer. I very much doubt if it is possible." However, he described the techniques for making metal alloys. Twenty books and treatise in chemistry, written in the Persian language (Farsi), are known to be the work of Razi.

According to al-Biruni, as noted by Nayernouri,⁹ Razi stopped his studies in alchemy because the chemical experiments caused him an eye-disease. At age 30, Razi began his medical and philosophical studies under Ali Ibn Rabban al-Tabari, a physician-philosopher from the ancient city of Merv in western Iran. Nayernouri⁹ disputes the accuracy of al-Tabari as Razi's mentor in medicine. He states that Razi may have utilized al-Tabari's texts in medicine since al-Tabari may have died prior to Razi's birth. Razi gained practical experience as the director of the Royal Hospital at Rey. Another of his teachers of medicine was the well-known physician Ali Ibn Sahl (a Jewish convert to Islam, belonging to the famous medical school of Tabaristan or Hyrcania). Soon he surpassed his teachers in medical knowledge and practice. Later, by invitation of the Islamic ruler he became the head of Muqtadari Hospital for a long time. It has been written that the same Caliph asked Razi to build a hospital, but before doing so, Razi put fresh pieces of meat in various places in the city of Baghdad, Iraq. Some time later, he checked each piece of meat to find the least spoiled one and chose that place as the site for the hospital. Because of his high reputation as a physician-philosopher and teacher, students flocked to him from all over the Islamic territories. In his book entitled *Shukuk 'ala Jalinus* (Doubt about Galen), he praised Galen's commendable contribution to medicine. However, he rejected Galen's claim of the superiority of the Greek language and many of his medical views since Galen's description of some diseases did not agree with his own clinical observations, i.e., the run of fever. In some cases Razi believed that his clinical experience exceeded that of Galen. Further, he rejected Socrates and Aristotle's thoughts about the dichotomy of mind-body and pioneered the concept of mental health and self-esteem as being essential to a patient's welfare. The "sound mind,

healthy body” connection prompted him to communicate frequently with his patients on a personal rather than the patronizing level which was characteristic for that time. He encouraged them to heed his advice as a path to their recovery and bolstered their fortitude and determination to resist the illness resulting in a speedy recovery. In his book about spiritual medicine, Razi presented ethical views of the physician-scientist. He discussed the significance of improving the spiritual quality of patients. Kasymov¹⁰ suggests that Razi’s spiritual medicine is seen as synonymous to the notion of “medical ethics.” Razi’s medical views were influenced by Hippocrates and Galen. In his theories, Razi was a Galenist; but in practice, he apparently was guided more by the principles of Hippocrates but his erudition was broad and deep, and he demonstrated considerable originality.^{11,12}

Razi combined psychological methods and physiologic explanations. He used psychotherapy in a primitive but dynamic fashion.¹² He set clear standards for the professional practice of physicians. He was a tireless and prolific author in medicine. About 40 of his medical books and treatise are still extant in the libraries and museums of Iran, Britain, France, India, and the Library of Congress of the United States (a Latin translation). George Sarton in his *Introduction to the History of Science*¹⁴ wrote that Razi was the greatest physician of Islam and the Medieval Ages. The May 1970 *Bulletin of the World Health Organization*, paid special tribute to Razi stating “His writings on smallpox and measles show originality and accuracy, and his essay on infectious diseases was the first scientific treatise on the subject.” Razi was a pioneer in many areas of medicine particularly in the fields of pediatrics and infectious diseases.¹⁵

He wrote an immense medical encyclopedia, a comprehensive book on medicine called *Kitab al-Hawi fi al-Tibb* (Liber Continens) consisting of 23 volumes containing many extracts from Greek and Hindu authors and clinical observations of his own. A compendium to this book was the *Book of Experience or Casebook*, a collection of case histories recorded by some of his students and issued posthumously. This book was translated into Latin in 1279 under the title of *Liber Continens* by Faraj Ibn Salem (known in Europe as Farraguth) a physician of Sicilian-Jewish origin employed by Charles of Anjou, to translate medical works. Even more influential in Europe

was Razi’s book of medicine, a short general textbook in ten chapters based largely on Greek science and entitled *Kitab al-Mansuri* (Liber Almansoris) which he dedicated in 903 to the Samanid prince Abu Salih al-Mansur Ibn Ishaq, Governor of Rey.¹⁵ This treatise was subsequently translated into Latin in Toledo, Spain, by Geraldo di Cremona in 13th century AD. A third and extremely influential treatise was Razi’s *Kitab al-Judari wa al-Hasbah* (De variolis et morbilliis) was translated in 18th century into Latin and English.¹⁶ The last book related to smallpox and measles and in it Razi makes a number of prescient observations, not described previously. Among these observations, he writes “Smallpox appears when the blood boils and infected, resulting in vapors being expelled. Thus, juvenile blood (which looks like wet extracts appearing on the skin) in being transformed into richer blood, having the color of mature wine. At this stage, smallpox shows up essentially as bubbles found in wine-as blisters. This disease can also occur at other times-meaning not only during childhood. The best thing to do during this first stage is to keep away from it otherwise this disease might turn into an epidemic.” Also, Razi noted the illness was transmitted from person to person. His explanation of why survivors of smallpox do not develop the disease a second time is the first theory of acquired immunity.¹⁷ In differentiating smallpox from measles in his book of *al-Judari wa al-Hasbah*, Razi wrote “The eruption of the smallpox is preceded by a continued fever, pain in the back, itching in the nose, and terrors in the sleep. These are the more peculiar symptoms to approach, especially a pain in the back with fever; then also a pricking which the patient feels all over his body; a fullness of the face, which at times comes and goes; an infectious color, and vehement redness in both cheeks; a redness of both eyes, heaviness of the whole body; great uneasiness, the symptoms of which are stretching and yawning; pain in the throat and chest, with slight difficulty in breathing and cough; a dryness of breath, thick spittle and hoarseness of the voice; pain and heaviness of the inquietude, nausea and anxiety; (with this difference that the inquietude, nausea, and anxiety are more frequent in the measles than in the smallpox; while on the other hand, the pain in the back is more peculiar to the smallpox than to the measles) heat of the whole body; and an inflamed colon, and shining redness, especially an intense redness of the gums.”

Other medical contributions

Razi was the first to note the pupillary reaction to light. He wrote “In the middle of the iris appears a hole which contracts when the light is strong but dilates in obscurity.”¹⁸ He described the operation for cataract also and stated, “I have split the lower part of the pupil and have led the cataract outward”.¹⁹

He was the first physician to fully detail the definitive manifestations of gonorrhoea.²⁰ He was the first to describe spina bifida in *The Liber Continenis*. In this book, he discussed infantile convulsions.²¹ He described hydrocephalus as congenital or acquired postnatally as well as describing microcephaly. The latter he considered to be incurable. Razi is known for having described allergic rhinitis in an article on the reason prince Abou Zayd Balkhi suffered from rhinitis when smelling roses in spring. He was the first to realize that fever is a natural defense mechanism, the body’s way of fighting disease. In his writings, Razi differentiated rheumatism from gout. He did animal experimentations with new drugs, noting their effects and toxicity before administering them to his patients. A volume of *Kitab al-Hawi fi al-Tibb* is dedicated to pharmacology. Indeed pharmacy can trace much of its historical foundations to singular achievements of Razi. His birthday of August 27 has been adopted as the Pharmacology Day in Iran.

Conclusion

With the rise of Islam in the 7th century AD and the establishment of the Eastern Caliphate (Abbasid) in the eighth century AD in Baghdad, there was a migration of physician-philosophers from the Academy of Gondishapur in Persia to Baghdad, initiating the coming of the “Islamic Golden Age”. Among the pillars of the Golden Age of Islamic Medicine was the Persian alchemist-physician-philosopher Zakariya Razi. From various sources of medical literature cited in this paper, one can summarize the character and the accomplishments of Zakariya Razi as follows: He wrote the first treatise on pediatrics, the *Practica Puerorum*.²¹ He was a rationalist, extremely confident in the power of reason, free from every kind of prejudice, and daring in the expression of his thoughts. He was described as outstanding in generosity and always willing to treat and help the poor. He was the most appealing healer of his age from a modern vantage point. Students and practitioners thronged to his lectures,

as apparently he was a brilliant bedside teacher. A man of his time, he revered learning and based his knowledge on the books of authorities. But, he was an independent thinker and not afraid to rely on his own observations when they contradicted the past. He counseled others saying “All that is written in books is worth much less than the experience of a wise doctor.”

Razi’s fame rested on clear-cut clinical descriptions of illness, original observations, and a pragmatic approach to treatment. He gave the first accurate descriptions of smallpox and measles, advised proper food in preference to drugs in treatment, and recommended simple rather than complex remedies. Despite the large fees and honors he received, his generosity to the less fortunate left him poor at the time of his death. For several centuries, his books together with those of Avicenna’s *Canon of Medicine* were used as the primary texts in major medical schools in Europe. Many countries have issued commemorative stamps in Razi’s honor. His portrait hangs in the hall of School of Medicine in Paris.

References

- 1 Behbehani AM. The smallpox story: life and death of an old disease. *Microbiol Rev*. 1983; **47**: 455 – 509.
- 2 Brier B. Infectious diseases in ancient Egypt. *Infect Dis Clin N Am*. 2004; **18**: 17 – 27.
- 3 Hopkins DR. Smallpox: ten years gone. *Am J Public Health*. 1988; **78**: 1589 – 1595.
- 4 Cunha BA. The cause of plague of Athens: plague, typhoid, typhus, smallpox, or measles? *Infect Dis Clin N Am*. 2004; **18**: 29 – 43.
- 5 Nakano JH. Comparative diagnosis of pox virus diseases. In: Kurstak E and Kurstak C, eds. *Comparative Diagnosis of Viral Diseases*. Vol. I, Part A. New York; San Francisco; London: Academic Press; 1977: 290.
- 6 Wilkinson L. The development of the virus concept as reflected in corpora of studies on individual pathogens. 5. Smallpox and the evolution of ideas on acute (viral) infections. *Med Hist*. 1979; **23**: 1 – 28.
- 7 Shulman ST. The history of pediatric infectious diseases. *Pediatr Res*. 2004; **55**: 163 – 176.
- 8 Elgood C. *A Medical History of Persia and the Eastern Caliphate*. London: Cambridge University Press; 1951.
- 9 Nayernouri T. Zakariya Razi: the Iranian physician and scholar. *Arch Iran Med*. 2008; **11**: 229 – 234.
- 10 Kasymov AI. Bioethical views of Abu Bakr al-Razi (Rhazes) [in Ukrainian]. *Lik Sprava*. 2006; **7**: 101 – 104.
- 11 DeBakey ME. A surgical perspective. *Ann Surg*. 1991; **213**: 499 – 531.
- 12 Bender GA. *Rhazes and Arabic Medicine, in Great Moments in Medicine*. Detroit: Northwood Institute Press; 1066: 62 – 67.
- 13 Daghastani AN. Images in Psychiatry. al-Razi (Rhazes), 865 – 925. *Am J Psychiatry*. 1997; **154**: 1602.
- 14 Sarton G. *The History of Science and the New*

- Humanism*. New York: Henry Holt and Company; 1931.
- 15 Al-Razi, the Clinician. In: National Library of Medicine. *Islamic Culture and the Medical Arts*. Available from: URL: http://www.nlm.nih.gov/exhibition/islamic_medical/islamic_06.html (Last updated: 15 April, 1998)
 - 16 Razi. *A Treatise on the Smallpox and Measles*. Translated by Greenhill WA. London: the Sydenham Society; 1847.
 - 17 Barquet N, Domingo P. Smallpox: the triumph over the most terrible of the ministers of death. *Ann Intern Med*. 1997; **127**: 635 – 642.
 - 18 Ascher KW. The first pupillary light reflex test ever performed. *Trans Am Ophthalmol Soc*. 1962; **60**: 53 – 59.
 - 19 Barkan H. Some historical incidents in the development of the operation for cataract. *Cal West Med*. 1925; **23**: 585 – 591.
 - 20 Oriel JD. *The Scars of Venus*. London: Springer-Verlag. 2006; 99: 437.
 - 21 Radbill SX. The first treatise on pediatrics. *Am J Dis Child*. 1971; **122**: 369 – 376.