# History of Islam

An encyclopedia of Islamic history

# Medicine and Medical Education in Islamic History

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**MEDICAL EDUCATION**

In 636 A.D., the Persian City of Jundi-Shapur, which originally meant beautiful garden, was conquered by the Muslims. Its great university and hospital were left intact. Later other Islamic medical schools were built according to the Jundi-Shapur pattern. Medical education was serious and systematic. Lectures and clinical sessions included in teaching were based on the apprentice system. The advice given by Ali ibnul-Abbas (Haly Abbas: – 994 A.D.) to medical students is as timely today as it was then2. "And of those things which were incumbent on the student of this art (medicine) are that he should constantly attend the hospitals and sick houses: pay unremitting attention to the conditions and circumstances of their inmates, stay in company with the most astute professors of medicine, and inquire frequently as to the state of the patients and symptoms apparent in them, bearing in mind what he has read about these variations, and what they indicate of good or evil."

Razi (Razes: 841-926 A.D.) advised the medical students that while they examine a patient, they should bear in mind the classic symptoms of a disease as given in textbooks and compare them with what they found".

The ablest physicians such as Razi (Al-Razes), Ibn-Sina (Avicenna: $80-1037 A.D.) and Ibn Zuhr (Avenzoar: 116 A.D.) worked both as the directors and the deans of medical schools. They studied patients and prepared them for student presentation. Clinical reports of cases were written and preserved for teaching," and regular registers were maintained.

Training in Basic Science

Only Jundishapur or Baghdad had separate schools for studying basic sciences. Candidates for medical study received basic preparation from private tutors through private lectures and self study. in Baghdad anatomy was taught by dissecting the apes, observing skeletal studies, and studying didactics. Other medical schools taught anatomy through lectures and illustrations. Alchemy was one of the prerequisites for admission to a medical school. The study of medicinal herbs and pharmacognosy rounded off the basic training. A number of hospitals maintained herbal gardens as a source of drugs for the patients and a means of instruction for the students.

Upon completion of the basic training, a candidate was admitted as an apprentice to a hospital where, along with a large group, he was assigned to a young physician for indoctrination, preliminary lectures, and familiarization with library procedures and uses. During this preclinical period, most of the lectures were on pharmacology and toxicology and the use of antidotes.

Clinical training

The next step was to give the student full clinical training. During this period students were assigned in small groups to famous physicians and experienced instructors, for ward rounds, discussions, lectures, and reviews. Early in this period therapeutics and pathology were taught. There was a strong emphasis on clinical instruction and some Muslim physicians contributed brilliant observations that have stood the test of time. As the students progressed in their studies they were exposed more and more to the subjects of diagnosis and judgment. Clinical observation and physical examination were stressed. Students (or clinical clerks) were asked to examine a patient and make a diagnosis of the ailment. Only after all else had failed would the professor make the diagnosis himself. While performing physical examination, the students were asked to examine and report six major factors: the patients' actions, excreta, the nature and location of pain, and swelling and effluvia of the body. Also noted was color and feel of the skin-whether hot, cool, moist, dry, flabby. Yellowness in the whites of the eye (jaundice) and whether or not the patient could bend his back (lung disease) was also considered important.'

After a period of ward instructions, students were assigned to outpatient areas. After examining the patients, they reported their findings to the Instructors. After discussion, treatment was decided and prescribed. Patients who were too ill were admitted as inpatients. The maintenance of records for every patient was the responsibility of the students.

Curriculum

Different medical schools pursued different clinical curriculum and offered separate courses of studies, but the mainstay was usually internal medicine. Emphasis was placed on clarity and brevity in describing a disease and the separation of each eAtity. Until the time of Ibn Sina the description of meningitis was confused with acute infection accompanied by delirium. Ibn Sina described the symptoms of meningitis with such clarity and brevity that there is very little that can be added to it even after a thousand years. Surgery was also a part of the curriculum. After completing the prescribed course of studies, some students specialized under famous specialists, while others specialized during their clinical training. According to Elgood, a knowledge of many surgical procedures such as amputation, excision of varicose veins, and hemorrhoids was essential. Orthopedics was widely taught, and the use of plaster of paris for casts after reduction of fractures was routinely shown to students. This method of treating fractures was rediscovered in the West in 1852. Although ophthalmology was practiced widely, it was not taught regularly in medical schools. Apprenticeship to an eye doctor was the preferred way of specializing in ophthalmology. Surgical treatment of cataract was very common. Obstetrics was left to midwives. Medical practitioners consulted among themselves and with specialists Ibn Sina and Hazi both widely practiced and taught psychotherapy. After completing his medical training, every medical graduate was required to pass a licensing examination before starting his medical practice. It is important to note that there existed a Scientific Association which was formed in the hospital of Mayyafariqin to discuss the conditions and diseases of the patients.'

Licensing of Physicians

In Baghdad in 931 A.D., Caliph Al-Muqtadir learned that a patient had died as the result of a physician's error. Thereupon he ordered his chief physician, Sinan ibn Thabit bin Qurrah to examine all those who practiced the art of healing. In the first year of the decree more than 860 were examined in Baghdad alone. From that time on, licensing examinations required and administered in various places. Licensing Boards were under a government Official called Muhtasib or inspector general. Muhtasib also inspected weights and measures of traders and pharmacists. Pharmacists were employed as inspectors to inspect drugs and maintain quality control for drugs sold in a pharmacy or apothecary. The chief physician gave oral and practical examination, and if the young physician was successful, the Muhtasib administered the Hippocratic oath and Issued a license. After a thousand years, licensing Of physicians has been implemented in the West, particularly in America by the State Licensing Board Specialties such as in Medicine, Surgery, Radiology, etc. European medical schools followed the pattern set by the Islamic medical schools and even in the early nineteenth century, students at the Sorbonne could not graduate without reading Ibn Sina's Qanun (Canon). According to Razi a physician had to satisfy two conditions for selection: firstly, he was to be fully conversant with the new and the old medical literature, and secondly, he must have worked in a hospital as house physician.

**HOSPITALS**

The development of efficient hospitals was an outstanding contribution of Islamic medicine. The hospitals served all citizens free and without any regard to their color, religion, sex, age or social status. The hospitals were run by government and their directors were physicians.

Hospitals had separate wards for male and female patients and were staffed with nursing and other ancillary staff of the same sex. Different diseases such as fever, wounds, infections, mania, eye conditions, cold diseases, diarrhea, and female disorder were allocated different wards. Convalescence centers were divided into separate sections. Hospitals provided patients with unlimited water supply and bathing facilities. Only qualified and licensed physicians were allowed by law to practice medicine. The hospitals were teaching hospitals to educate and train medical students. They had housing for students and house-staff, and contained pharmacies dispensing free drugs to patients. All hospitals had their conference rooms and expensive libraries containing the most up-to-date books. According to Haddad"'· the library of the Tulum Hospital which Was founded in Cairo in 872 A.D. (1100 years ago) bad 100,000 books. Universities, cities and hospitals acquired large libraries, physicians had their own extensive personal book collections, at a time when printing was unknown and book editing was done by skilled and specialized scribes putting in long hours of manual labor. Mustansiriyya University in Baghdad contained 80,000 volumes; the library of Cordova 600,000 volumes: that of Cairo 2,000,000 and that of Tripoli 3,000,000 books.

These hospitals kept records of all their patients and their medical care, something done for the first time in medical history.

For considerations of treatment, the hospital was divided into two main departments, out- patient and in-patient departments. The in-patient department differed only slightly from any modern in-patient department. At the Tulum hospital, on admission the patients were given special apparel while their clothes, money, and valuables were stored away, and returned to them at the time of their discharge. On discharge, they also received five gold pieces each to tide them over until they could support themselves.

The hospital and medical school at Damascus had elegant rooms and an extensive library. Healthy people are said to have feigned illness in order to enjoy its cuisine. There was a separate hospital in Damascus for lepers, while, in Europe, even six centuries later, lepers were condemned and burned to death by royal decree.

The Qayrawan Hospital (built in 830 A.D. in Tunisia) was characterized by its spacious wards, waiting rooms for visitors and patients, and female nurses from Sudan, the first account of nursing in Arab history. The hospital also provided facilities for performing prayers.

The Al-Adudi hospital (built in 981 A.D. in Baghdad) was furnished with the latest equipment and supplies available at the time. It had interns, residents, and 24 consultants attending its professional activities. An Abbasid minister, Ali ibn Isa, requested the court physician, Sinan ibn Thabit, to organize regular visiting of prisons by medical officers."

At a time when Paris and London were mud streets and hovels, Baghdad, Cairo, and Cordova had hospitals which incorporated innovations which sound amazingly modern. It was chiefly in the humaneness of patient care that the Muslim hospitals excelled. Near the wards of those : afflicted with fever, fountains cooled the air; the insane were treated with gentleness; and at night music and storytelling soothed the patients."

The Bimaristans (hospitals) were of two types – the fixed and the mobile. The mobile hospitals were transported upon beasts of burden and were erected from time to time as required. The physicians in the mobile were of the same standing as those who served the regular in the hospitals. Similar mobile hospitals accompanied the armies in the field. The field hospitals were well equipped with medicaments, instruments, tents and a staff of doctors, nurses, and orderlies. The travelling clinics served the totally disabled, the disadvantaged and those in remote areas. These hospitals were also used by prisoners, and by the general public, particularly in times of epidemics.

**BACTERIOLOGY**

Al-Razi was asked to choose a site for a new hospital when he came to Baghdad. In order to choose the most hygienic area, he hung pieces of meat in different parts of the city and observed where they decomposed the least.

Ibn Sina stated explicitly that the bodily secretion is contaminated by foul earthly body before getting infected. Ibn Khatima stated that man ss surrounded by minute bodies which enter the human system and cause disease.

In the middle of the fourteenth century when the "black plague" ravaged Europe and Christians stood helpless, considering it an act of God, Ibn al Khatib of Granada composed a treatise in the defense of the theory of infection in the following way.

To those who say, "How can we admit the possibility of infection while the religious law denies it?" we reply that the existence of contagion is established by experience, investigation, the evidence of the senses and trustworthy reports. These facts constitute a sound argument. The fact of infection becomes clear to the investigator who notices how he who establishes contact with the afflicted gets the disease, whereas he who is not in contact remains safe, and how transmission is affected through garments, vessels and earrings."

Al-Razi wrote the first medical description of smallpox and measles two important infectious diseases He described the clinical difference between the two diseases so vividly that nothing since has been added.'" Ibn Sina suggested the communicable nature of tuberculosis. He is said to have been the first to describe the preparation and properties of sulfuric acid and alcohol. His recommendation of wine as the best dressing for wounds was very popular in medieval practice. However Razi was the first to use silk sutures and alcohol for hemostasis. He was also the first to use alcohol as an antiseptic.

**ANESTHESIA**

Ibn Sina originated the idea of the use of oral anesthetics. He recognized opium as the most powerful mukhadir (intoxicant or drug). Less powerful anesthetics known at the time were mandragora, poppy, hemlock, hyoscyamus, deadly nightshade (belladonna), lettuce seed, and snow or ice cold water. The Arabs invented the soporific sponge which was the precursor of modern anesthesia. It was a sponge soaked with aromatics and narcotics and held to the patient's nostrils.

The use of anesthesia in Islam was one of the reasons why surgery rose to the level of an honorable profession, while in Europe, surgery was belittled and practiced by barbers and quacks. The Council of Tours in 1163 A.D. declared "Surgery is to be abandoned by the schools of medicine and by all decent physicians". Burton'" stated that "anesthetics have been used in surgery throughout the East for centuries before ether and chloroform became the fashion in civilized West."

**SURGERY**

Al-Razi is the first to use the seton in surgery and animal gut for sutures. Abu al Qasim Khalaf Ibn Abbas Al-Zahrawi (930-1013 A.D.), known to the west as Abulcasis, Bucasis or Alzahravius, is considered to be the most famous surgeon in Islamic medicine. In his book Al- Tasrif, he described hemophilia for the first time in medical history. The book contains the description and illustration of about 200 surgical instruments many of which were devised by Zahrawi himself". In it Zahrawi stresses the importance of the study of Anatomy as a fundamental prerequisite to surgery. He advocates the reimplantation of a fallen tooth and the use of dental prosthesis carved from cow's bone, a better alternative to the wooden dentures worn by the first President of America, George Washington seven centuries later. Zahrawi appears to be the first surgeon in history to use cotton (Arabic word) in surgical dressings in the control of hemorrhage, as padding in the splinting of fractures, as a vaginal padding in the tearing of the pubis and in dentistry. He introduced the method for the removal of kidney stones by cutting into the urinary bladder. He was the first to teach the lithotomy position for vaginal operations. He described tracheotomy, distinguished between goiter and cancer of the thyroid, and explained his invention of a cauterizing iron which he also used to control bleeding. His description of varicose veins stripping, even after ten centuries, sounds almost like modern surgery." In orthopedic surgery he introduced what is called today Kocher's method of reduction of shoulder dislocation and patellectomy, a thousand years before Brooke reintroduced it in 1937.

Ibn Sina's description of the surgical treatment of cancer holds true even today after 1,000 years. He says the excision must be wide and bold; all veins running to the tumor must be included in the amputation. Even if this is not sufficient, then the area affected should be cauterized.

The Muslim surgeons performed three types of surgery: vascular, general, and orthopedic. Ophthalmic surgery was a specialty which was quite distinct both from medicine and surgery. They freely opened the abdomen and drained the peritoneal cavity in the approved modern style. To an unnamed surgeon of Shiraz is attributed the first colostomy operation. Liver abscesses were treated by puncture and exploration. Today surgeons all over the world practice and use several surgical procedures first introduced by Zahrawi a thousand years ago.

**MEDICINE**

One of the most brilliant contributions to medicine was made by Al Razi who differentiated between smallpox and measles, two diseases that were hitherto thought to be one single disease.'" He is credited with many contributions: he was the first to describe true distillation, glass retorts and luting, corrosive

sublimate, arsenic, copper sulfate, iron sulfate, saltpeter, and borax in the treatment of diseases." He introduced mercury compounds as purgatives (after testing them on monkeys); mercurial ointments and lead ointment." His interest in urology focused on problems involving urination, venereal disease, renal abscess, and renal and vesical calculi. He described hay-fever or allergic rhinitis.

Among other Arab contributions to medicine are included the discovery of itch mite of scabies (Ibn Zuhr), anthrax, ankylostoma and the guineaworm by Ibn Sina, and sleeping sickness by Qalqashandy. They described abscess of the mediastinum. They also understood tuberculosis and pericarditis.

Al Ash'ath demonstrated gastric physiology by pouring water into the mouth of an anesthetized lion and showed the distensibility and movements of the stomach, preceding Beaumont by about a thousand years. Abu Sahl al-Masihi explained that the absorption of food takes place more through the intestines than the stomach. Ibn Zuhr introduced artificial feeding either by gastric tube or by nutrient enema. Using the stomach tube, the Arab physicians performed gastric lavage in case of poisoning. Ibn Al-Nafis was the first to discover pulmonary circulation.

Ibn Sina in his masterpiece Al-Qanun (Canon), containing over a million words, described complete studies of physiology, pathology and hygiene. He specifically discoursed upon breast cancer, poisons, diseases of the skin, rabies, insomnia, childbirth and the use of obstetrical forceps, meningitis, amnesia, stomach ulcers, tuberculosis as a contagious disease, facial ties, phlebotomy, tumors, kidney diseases and geriatric care. He defined love as a mental disease.

**OPHTHALMOLOGY**

The Arab physicians exhibited a high degree of proficiency and certainly were foremost in the treatment of eye diseases. Words such as retina and cataract are of Arabic origin. In ophthalmology and optics Ibn al Haytham (965-1039 A.D.) known to the West as Alhazen wrote the Optical Thesaurus from which such worthies as Roger Bacon, Leonardo da Vinci and Johannes Kepler drew theories for their own writings. In his Thesaurus he showed that light falls on the retina in the same manner as it falls on a #urface in a darkened room through a small aperture, thus conclusively proving that vision happens when light rays pass from objects towards the eye and not from the eye towards the object as thought by the Greeks. He experiments for testing the angles of incidence and reflection, and a theoretical proposal for magnifying lens (made in Italy three centuries later). He also taught that the image made on the retina is conveyed along the optic nerve to the brain. Razi was the first to recognize the reaction of the pupil to light, and Ibn Sina was the first to describe the exact number of extrinsic muscles of the eyeball, namely six. The greatest contribution of Islamic medicine in practical ophthalmology was in the matter of cataract. The most significant development in the extraction of cataract was developed by Ammar bin All of Mosul, who introduced a hollow metallic needle through the sclerotic and extracted the lens by suction. Europe rediscovered this in the nineteenth century.

**PHARMACOLOGY**

Pharmacology took roots in Islam during the 9th century. Yuhanna bin Masawayh (777- 857 A.D.) started scientific and systematic applications of therapeutics in the Abbasid capital. His student Hunayn bin Ishaq al-Ibadi (809-874 A.D.) and his associates established solid foundations of Arabic medicine and therapeutics in the ninth century. In his book al-Masail Hunayn outlined methods for confirming the pharmacological effectiveness of drugs by experimenting with them on humans. He also explained the Importance of prognosis and diagnosis of diseases for better and more effective treatment. Pharmacy became an independent and separate profession from medicine and alchemy.)" With the wild sprouting of apothecary shops, regulations became necessary and were imposed to maintain quality control. The

Arabian apothecary shops were regularly inspected by a syndic (Muhtasib) who threatened the merchants with humiliating corporal punishments if they adulterated drugs." As early as the days of al-Mamun and al Mutasim pharmacists had to pass examinations to become licensed professionals and were pledged to follow the physician's prescriptions. Also by this decree, restrictive measures were legally placed upon doctors, preventing them from owning or holding stock in a pharmacy.

Methods of extracting and preparing medicines were brought to a high art, and their techniques of distillation, crystallization, solution, sublimation, reduction and calcination became the essential processes of pharmacy and chemistry. With the help of these techniques, the Saydalanis (pharmacists) introduced new drugs such as camphor, senna, sandalwood, rhubarb, musk, myrrh, cassia, tamarind, nutmeg, alum, aloes, cloves, coconut, nux vomlca, cubebs, aconite, ambergris and mercury.(g) The important role of the Muslims in developing modern pharmacy and chemistry is memorialized in the significant number of current pharmaceutical and chemical terms derived from Arabic: drug, alkali, alcohol, aldehydes, alembic, and elixir among others, not to mention syrups and juleps. They invented flavoring extracts made of rose water, orange blossom water, orange and lemon peel, tragacanth and otheraromatic ingredients. Space does not permit me to list the contributions to pharmacology and therapeutics, made by Razi, Zahrawi, Biruni, Ibn Butlan, and Tamimi.

**PSYCHOTHERAPY**

From freckle lotion to psychotherapy – such was the range of treatment practiced by the physicians of Islam. Though freckles continue to sprinkle the skin of 20th century man, in the realm of psychosomatic disorders, both Al-Razi and Ibn Sina achieved dramatic results, antedating Freud and Jung by at least a thousand years. When Razi was appointed physician- in-chief to the Baghdad Hospital, he devoted a ward exclusively for the mentally ill making it the first hospital ever to have such a ward."

Al-Razi combined psychological methods and physiological explanations, and he used psychotherapy in a dynamic fashion. Al-Razi was once called in to treat a famous caliph who had severe arthritis. He advised a hot bath, and while the caliph was bathing, Razi threatened him with a knife, saying he was going to kill him. This deliberate provocation increased the natural caloric, enhanced its strength, and consequently dissolved the already softened humors, so that the caliph stood up in the bath and ran after A1-Razi.

The Arabs brought a refreshing spirit of dispassionate clarity into psychiatry. They were free from the demonological theories which swept over the Christian world and were therefore able to make clear cut clinical observations about the mental diseases."

Najab ud din Muhammad," a contemporary of Al-Razi, has left many excellent descriptions of various mental diseases. His carefully compiled observations about the patients made up the most complete classification of mental diseases theretofore known. Najab described agitated depression, obsessional types of neurosis, Nafkhae hrlalikholia (combined priapism and sexual impotence). Kutrib (a form of persecutory psychosis), Dual-Kulb (a form of mania).

Ibn Sina recognized 'physiological psychology' in treating illnesses involving emotions. From the clinical perspective Ibn Sina developed a system for associating changes in the pulse rate with inner feelings which has been viewed as predating the word association test of Jung. He is said to have treated a seriously ill patient by feeling the patient's pulse and reciting aloud to him the names of provinces, districts, towns, streets, and people. By noticing how the patient's pulse quickened when names were

mentioned. Ibn Sina deduced that the patient was in love with a girl whose home Ibn Sina was able to locate by the digital examination. The man took Ibn Sina's advice, married the girl, and recovered from his illness.

It is not surprising to know that at Fez, Morocco, an asylum for the mentally ill had been built early in the 8th century, and mental asylums were also built by the Arabs in Baghdad in 705 A.D., in Cairo in 800 A.D., and in Damascus and Aleppo in 1270 A.D. In addition to baths, drugs, kind and benevolent treatment given to the mentally ill, musico-therapy and occupational therapy were also employed. These therapies were highly developed. Special choirs and live music bands played daily to entertain the patients by singing, music, and other light-hearted performances.

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