

CONTRIBUTIONS OF MUSLIMS TO MEDICINE AND SCIENCE: UP TO THE MIDDLE OF THIRTEENTH CENTURY

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Bardoc wrote, "With the exception of an occasional note or brief reference in the textbook of medicine and surgery, the student of medicine has little inducement to direct his attention to the work of the great pioneers of science."

One possible consequence of this reduced emphasis on the historical perspective in one's education is the occasionally noted tendency to treat the scientific and philosophical works of the past as contemporary. A re-acquaintance with history appears to be the only remedy for such conceptual lapses. Present article is a modest effort in this direction.

History of medicine during the glory of muslims has been inseparably connected with the history of Islam itself. The aim of the present article is to review the contributions made by the muslims to the Healing Arts, up to the middle of the thirteenth century i.e. up to the death of the celebrated botonist, Abn-Baeter. Able and successful scientists, such as the admirable Makhzan-ul-dviya" Mir Muhammad Hussain Khuransani (whom Dr. Dimdek consulted freely while writing his valuable *Materia-Medica*), have certainly come after the thirteenth century; yet, the period before it seems to stand out as the most important period in the muslim history in influencing the subsequent growth of medical Arts.

The knowledge of medicine came to the muslims through the translation of all existing Greek, Syriac, and Sanskrit literature in medicine, mathematics and astronomy. It flourished with the advances made by them in chemistry, physics, pharmacology and other disciplines. But, before coming to the classical period of their medicine (only two centuries of the birth of Islam) let us look at the sources of their information and the rapid progress of their knowledge.

Different races and distinct clans possessing various cultures, customs, religions and practices came under the Islamic rule within a short period of time following its advent. Africa, Persia and India, each in turn, influenced the capable muslim mind through understanding and assimilation of their Arts and Sciences.

Under Haroon-al-Rasheed and subsequently under his successors, Al-Mansoor and Al Mamoon, the mammoth task of translating the works from the Greek, Syriac, Sanskrit, Coptic and Persian to Arabic, was undertaken. Ancient works in almost every branch of learning (Philosophy, Mathematics, Medicine,

Astronomy, etc.) were translated by a royal mandate of Al-Mamoon. They were then widely disseminated among the scholars. As a result, Pythagoras, Hippocrates, Euclid, Archimedes, Socrates, Plato, Aristotle, Ptolemy and Galen became familiar to them as Fisagoras, Buqurat, Uqulidas, Urshemidus, Suqerat, Allatoon, Aras too, Batlimoos and Jalinoos. The Arabic proved not only equal but in some respects superior to Greek and Sanskrit in accomodating the concepts of philosophy and science. Sanskrit, like Greek, was highly cultivated and possessed valuable works in every branch of knowledge. The muslims, whose central seat of power was almost equidistant from Greece and India, were in constant contact with both of them. A separate mandate was issued by the Khalifa specially requiring choice Sasnskrit works to be translated into Arabic. As a result, the Sanskrit works, chiefly in philosophy, medicine and mathematics, were translated along with such other literary works as *Charaka Sasruta*.

During this period of the 9th century, the mosques were the universities in the great cities of Baghdad, Basra, Kufa, Samarkhand, Isfahan and Damascus. The Abbasid Khalifas constantly encouraged the pursuit of scholarly activities. The Fatimids of Egypt also tried to excel their Asiatic co-religionists as literary patrons and made Cairo, Tripoli, Tunis, Fez, Algiers, Morocco into major centers of learning. All through this time, the Moors in Spain were busy establishing the memorable institutions of Cordova, Seville, Toledo, Almeira, Granada and Valentia which eventually left their mark on Europe. "How great," continued Bardoc, "and famous some of these institutions have been is realized from the fact that no less than 6,000 professors and students were collected together in Baghdad at one time." Baghdad is also reported to have had about 860 practicing licensed physicians at any given time.

Cordova, characterised as "the mother of Philosophers," was considered to be the rival of Baghdad. It boasted three hundred mosques and forty one hospitals. It was from the muslim Spain that the era of modern civilization dawned over the whole of Europe. European scholars flocked to these Spanish universities and returned home to promulgate their ideas. Robert Bacon Toricelli and several such scholars were students of the muslims. The celebrated experiment's leading to the discovery of the

atmospheric pressure by Ibn-Batuta were continued by Taricelli. "The vast literature" wrote the thoughtful historian, Sedillot, "which existed during that period, the multifarious production of geniuses and the precious inventions of all sorts attest to a marvellous activity of intellect and justify the fact that the muslims were our masters in every thing."

These masters came out of the universities and spread over three continents of Europe, Asia and Africa. Almost all of them who devoted themselves to the physical sciences caught the mania of trying to discover one of the two things — Alchemia, which promised to turn the baser metals into gold, or the formula for the Elixir of eternal life. Their labour, however, laid down the foundation of modern science of Chemistry. It is to their knowledge of chemistry that much of the credit belongs for making advances in their medicine. They added their knowledge of chemistry to their already familiarised Unani (Greek) and Indian systems of medicine and thus became able to prepare new chemical remedies and to form many combinations of those already in use.

Their celebrated chemists such as Abu Musa Jafar, Al-Razi and others still command reverential treatment from history. It is no exaggeration at all to say that the extremely valuable of chemistry owes its existence to them. Abu Musa Jafar of Kufa has been characterized as the father of modern chemistry by European writers. He lived in the later part of the 8th century. His name marks an epoch in the history of chemistry in the same way as the names of Priestley and Lavoisier do. He was the first to describe the Nitric Acid (HNO_3) and Aqua Regia. Al-Razi lived and worked between 860 and 922 A. D. He is known for his discovery of Sulfuric Acid (H_2SO_4).

It is interesting and worthy of note that they defined Alchemy as "the Science of Balance." While chemistry was growing and helping the students of medicine, physics was not idle. As the "Elm-e-Tabiya" has also produced several distinguished scholars. One may not now remember even the name of Ali Hazin! He was a physicist and author of valuable works on optics. He was the first one to correct the prevailing Greek misconception about the nature of the vision "by demonstrating that the rays of light come from the external objects to the eye" and do not emanate from the eye as was commonly assumed. He considered the retina to be the seat of vision. He thought that the impressions generated by the impact of light on the retina were conveyed along the Optic Nerve to the brain. Generation of identical images from both eyes was considered by him to be the basis of binocular vision. He was aware that our sensory sight is by no means a trustworthy guide to perception of reality and described the illusions that can cause distortions of perceptions. He was also aware that the atmospheric

density decreases with increasing altitude. He argued that the light rays entering the atmosphere at an angle should follow a curvilinear path with its concavity toward the earth drawing conclusions that seemed to foreshadow the future discovery that we see celestial objects as they were when they emitted the light that now reaches our eyes. He calculated the height of the earth's atmosphere to be nearly 58 and half miles!

Abu Rahman was the first to construct the table of specific gravities more than 8 centuries ago. He also received and defended the doctrine of progressive development of animals forms arguing that man, in his progress, passed through a definite succession of states. Even though his enunciation "that man was once a bull, and then changed to an ass and afterwards into a horse and after that into an ape and finally became a man" was not exactly what we would accept today, it was a remarkable conceptualization of the evolutionary progress, discovery of which is attributed to the 18th and 19th century English Naturalists.

The medicine of the day was greatly influenced by the physical sciences. Any person aspiring to be a physician was required to have a reasonable knowledge not only of physics and chemistry but of logic and moral philosophy. The undue influence of Astrology and Astronomy often led to the prescription that certain preparations be made at particular times when the significant planets were in a particular position. This period saw the famous philosopher and astronomer Naseruddin Tusi prepare the memorable Ilkhani Talbes for Halaku Khan and build the observatory at Maragha.

Other medical specialties such as the Anatomy (Elm-e-Tashrih), Surgery (Elm-e-Jarrahi) and Botany (Elm-e-Nabatat) were making slow but perceptible academic progress. The major restricting factor was the general prohibition of the dissection of dead bodies. Still the Great School of Avicenna (Persia) and the Moorish School of Spain made significant contributions. While Bu Ali Senna made his influence felt in Asia, Ibn Rasheed (known to Europe as Averroes) reigned supreme in Spain. Abul Quasim of Cardova wrote a 32 volume medical and surgical treatise called "Al-Tasri" dealing with ligation of arteries, applications of cautery, correction of harelips, cataracts and fistulas... with ligation of arteries, application of cautery, correction of harelips, cataracts and fistulas dealt with exhaustively. Bardoe noted, "He recommended anatomy as a valuable aid to surgery." The contrast between the Moorish achievements and their contemporary Europe was forcefully presented by Draper when he wrote of Abul Quasim. "He shrinks not from the performance of the most formidable operations in his own and the obstetrical art. How different was all this from the state of things in Europe where a christian peasant,

ever stricken or overtaken by an accident, tried the nearest saint shrine and expected a miracle, while the Spanish Moor relied on the prescription or lancet of his physician or the bandage and knife of his surgeon." The Arab surgeons also invented the probe, improved the lancet and the couching needles, and perfected the then flourishing practice of "Uroscopy" (the art of judging diseases by examining the urine). Their Obstetricians "performed the gravest operations such as embriotomy and lithotomy." Presence of female physicians in those days should also be noted.

Ibn-Baitar was eminent among the Botanists of the thirteenth century. From the very young age he had shown an extraordinary interest in the study of plants. He visited Africa, India and Europe to learn all he could about plants and animals. On his return, he published three books on the medical plants, minerals and metals and animals respectively. His *Materia Medica* was a significant contribution indeed. He became the Vazir of Damascus for a short while before his death in 1248 A.D. Justice Amir Ali summarizes the attainments of that era as, "The Arabs invented the chemical pharmacy, were the founders of those institutions which are now called dispensaries." They established in every city, public hospitals called 'DARUL-SHAFAT' (The house of health) or 'MARISTAN' (short for BEEMARISTAN meaning the place for the patients). Dr. Pyne also lauds their achievements. They (the Arabs) produced the first Pharmacopoeia and established the first Apothecary shop." Their physicians often recommended the soporifics to their patients for pain, agitated states and insomnia.

Arrival on the scene of Abu Bakr Muhammad Ibn Zakria Al-Razi, known to Europeans as Rhazes and to Muslims as Al-Razi, ushered in the classical period of Islamic Medical history. The popular name Al-Razi indicates that he came from the town of Razi in Persia. He was an extremely competent chemist, physician and accurately described smallpox and measles in his two hundred or so scholarly, comprehensive and often encyclopedic works. He was appointed as in-charge of the hospital in Razi but was soon transferred to a hospital in Baghdad and became one of the First Physicians to Khalifa Mukhtadir Billah. His book, *AL-HAWI FIL-TIB*, provided a great deal of information about other works which preceded him and thus served the valuable function of preserving it for posterity. Bardoe noted that Al-Razi, "taught the external use of Arsenic, Mercurial ointments and sulphate of copper, and the internal use of brandy, nitre, borax, coral and gems." He was reported to have urged the use of techniques which required no medications as far as possible. If a medication was necessary, he urged the use of a simple one instead of a compound one. He was of course immortalized as a

chemist by his discovery of the Sulfuric Acid. He died around 922 A.D.

Ali Ibn-al Abbas (known to the Europeans as Heley!) hailed from Persia. His medical book called, *AL MELEKI*, appeared near the end of the tenth century and served as the standard text until replaced by the one from Bu Ali Sina.

Bu Ali Sina is often referred to as the MUALLIM-E-SALEES, the third teacher. The other two were Aristotle and Abu Nasr Farabi. His *AL-CANNON* was considered to be an authoritative text for centuries and was translated into Latin by Gerard of Cremona.

Then comes Abu Ali Husein Ibn Abdullah Ibn Sina (known to Europeans as Avicenna). He was born in a small village of the province of Bukhara in 983 A.D. His father was a tax collector under the Governor of Bukhara, Amir Nooh Ibn Mansoor Somani. The family moved to Bukhara after Abu Ali's brother was born. Abu Ali showed signs of precocious ability to learn by mastering the Arabic grammar and by memorizing the Qur'an before he was even ten years old. He studied Mathematics, Logic and Euclid, initially under Mahmood Massab and Hakin Abdullah Mayli, a friend of his father, but later on on his own with the help of various commentaries. He also mastered physics, theology and metaphysics before taking up medicine. He was reported to have acknowledged being influenced by the works of Abu Nasr Farabi and Aristotle on Metaphysics. In the wake of the political instability that came with the rise of Mahmood of Ghazni, he left for Khwarezm where he rubbed shoulders with such greats of his day as Abu Suheil Masihi and Al Beruni. Still, fearful of Mahmood of Ghazni, he moved to Tourjan, near the Caspian sea, and wrote his famous book, *QANOON*, before moving to Razi. For some reason, the political troubles constantly seemed to shadow him making him move, hide and go to prison until he settled in Isfahan where he died in 1037 A.D., at the age of fifty eight. He lies buried in Hamadan with an intriguing inscription engraved on his tomb, "The great philosopher, the great physician, Ibn Sina is dead. His books on philosophy have not taught him the art of living nor his books on medicine the art of living long." Of the hundreds of works he produced, only a few have survived. They include the eighteen volumes of "OF HEALTH AND REMEDIES" and the fourteen volumes of "QANOONS OF MEDICINE."

Next to deserve mention is the Spanish physician, Abu Marwan Abdul Malik Ibn Zohr, known to the European writers as Avenzoar. He came from a prominent family in which three generations had made substantial contributions to medicine. He taught and practiced medicine in Andalusia near the end of the eleventh century. His book, "Tays-sur Fil Mudawat

Wat Tadbir" was translated into Hebrew in 1280 and later on into Latin by Paravicinus. He is also famous for his other work, "Fi Adwiyat Wal Aghziat" (On Medicines and Foods). Baab quotes Ibn Rashid, a contemporary of Ibn Zohr, as complementing him by saying that he was "the most supreme" in Medicine from the time of Galen to his own. He opposed the superstitious remedies of the Astrologers as quackery and displayed considerable knowledge of Anatomy while describing the inflammations and abscesses of the mediastinum and the ways to distinguish them from Pleurisy and pericardial abscesses. From his writings it would appear that Medicine, Surgery and Apothecary were considered to be distinct professional specialties.

Abdul Walid Muhammad Bin Ahmad Ibn Rashid (Europeans know him as Averroes) was born in Qartaba (Cordova) in 1126 A.D. He studies Law, Divinity, Astrology and Mathematics before going on to become a physician. When his father died, he was appointed to succeed him as the Chief Judge of Cordova but was soon arrested because his religious views were suspect. Upon his release, however, he was appointed as the Khadi of Seville. He is famous for his treaties on physics and his commentaries on Aristotle which earned him the popular title, "the Commentator." He taught that Small Pox never attacks the same person more than once. He died around 1199 A.D. as the political power of muslims dwindled in Spain.

"In whatever direction we may look we meet, in various pursuits of peace and war and on letters of

science, Islamic imprints" appears to be an apt tribute to the Arabian and Islamic scholars for their contribution of words and concepts to the European languages. For example, Admiral (from Amirul Bahar), Algebra, Alcohol, Alchemia, Syrup, Elixir and several such words will constantly remind us that the label of "Dark Ages" to that era was erroneous indeed. We empathize with Dr. Draper when he writes, "I have to deplore the systematic manner ... in which the literature of Europe has contrived to put out of sight our scientific obligations to the muslims. Surely they can not be much longer hidden. Injustice founded on religious rancor and national credit can not be perpetuated forever." "After sunset, a man might walk through Cordova in a straight line for ten miles by the light of public lamps." Portrays a time when barbarism prevailed in Europe and several hundred years before there were any public lamps in London! The streets of Cordova were described as "solidly paved" when one routinely encountered ankle deep mud on a rainy day in Paris of the same era.

We rise out of such a resplendent and refulgent past. We have endured the gloom, despair and stagnation in our 'present'. The future, if it is to bring back the glory that was ours, will depend upon the sincerity and the extent to which we, individually and collectively, dedicate our efforts and resources. Each one of us should not only know that "Islam expects every man to do his duty" but must ensure that he has pushed his creative potential to its limits.