
Contribution of Muslims in the field of Medical Science

Dr. Zainab Sadiq

Assistant Professor, Department of Humanities, COMSATS University,
Islamabad.

zainab.sadiq@comsats.edu.pk

Dr. Ume Farwa

Assistant Professor, Department of Humanities, COMSATS University,
Islamabad.

ume.farwa@comsats.edu.pk

Ms. Shafia Jamil

Lecturer, Department of Humanities, COMSATS University, Islamabad.

shafia.jamil@comsats.edu.pk

ABSTRACT

E.G. Brown one among the western scholars in his famous work “**Arabian Medicine**” refuses to accept the valuable historical contribution of medieval Muslim scholars in the field of Medical Science. His argument lies on the assumption that the only contribution of the Muslim Scientist is the translation to the existing knowledge of Greek and he remain adamant in accepting the historical valuable contribution of Muslim scholars in the field of Medical Science. So, an attempt is made to investigate and highlight the Arab endeavors in original medical innovations which made them the sole source of many learning scholars. They have excelled in many areas like surgery, medicine, pharmacy, surgical instruments, and medical education. The main objective of this paper is to discuss the real contributions made by Muslim scientists and researchers in medical science during the medieval period and the way they paved the way for European Renaissance during the 14th to 16th centuries. The current study would also shed light on the contribution of Great Muslim Scholars like as Al-Razi, Avicenna, Ibn Nafis and many others through inscribed write-ups,

books and Encyclopedias and published material on the various areas of Medical Science.

Key words: Muslim Scientists. Medical. Contribution. Pharmacy. Medicine

Contribution of Muslims in the field of Medical Science

Attaining knowledge is lying in the basis of Islam like the very first revealed verses. Emphasizes on observing the signs in the horizons and within themselves. Allah SWT Says: “We will show them our signs in the horizons and within themselves”.¹

This verse includes all kinds of knowledge medical and astrology ect. By observing the golden age of Islam and the early scholar’s work we can imagine that how they transformed themselves into the living encyclopedia of Islam and mastered not only the Quran, Hadith, Fiqh and Usul ul Fiqh but also medical science, dentistry, medicine, surgery etc.

The claim of E.G Brown is based on assumption that from the period of Greek till renaissance nothing new has been introduced in Medicine. And this period is known as “Dark Ages”. The only contribution of Muslim Scientists has made is the translations of Greek and Roman literature and their (Muslims) cognition in this field is immature. And this statement has been propagated by other scholars as well.²

Unfortunately, it is not an easy task to answer this query and a lot of effort and in-depth knowledge is required to answer it.

It is true that Muslims have translated the Greek, Persian and Roman knowledge, but they have not followed it blindly. They have experimented, Searched, and then sorted out the right from wrong and then accepted it. And their translations show their eagerness, hard work, strong observation, and hunger to acquire knowledge because of which they could gain the knowledge and then transferred it to the modern times. And a person who don’t have knowledge of Science, Languages and evolution cannot interpret and contribute to the knowledge of science. So, these were the Muslim Scholars who examined, Interpreted, and experimented and then discovered the new dimension in the field of Medical Science. Consequently, they became the successors of History, Medicine Astrology,

Physics, Mathematics, and languages. For example, at the time of Abbasid caliphate “Baghdad” was the center for all type of literary activities. And the scholars, traders, Physicians, and visitors were used to come here to satisfy their thirst of knowledge. And the evidence can be seen from “Al-Qanoon fi tibb” of Inb-e-Sina and “Kitab Al Malooki” by Majossi and so on. As it is admitted

”كان الطب معدوماً فأحياه جالينوس و كان متفرقاً فجمعه الرازي و كان ناقصاً فكمّله ابن سينا البخاري“³

Origins of Islamic Medical Tradition:

The origin of Islamic Medical Tradition goes back to the time of Prophet Muhammad P.B.U.H who used different methods of treatment like Use of Honey, Cupping and Cauterization⁴ in case if doesn't cause pain to the patient.

One famous sayings of the Holy Prophet is, “God has not caused a single disease to descend upon men without providing a remedy”.⁵ This belief encouraged them to engage in Biomedical research and to seek the cure for different diseases.

In the wake of his lead, his contemporaries and the initial Caliphs provided strong backing to learning about medicine in addition to its teaching and practice. It is because of the impetus provided to Medical Sciences that Islamic medical research was at its height in the Middle Ages. Certain significant medical achievements of Muslims have been cited by Campbell in the following:

“The Arabians raised the dignity of the medical profession from that of menial calling to the rank of one of the learned professions; they were the first to introduce systematically arranged illustrations in their medical writings and gave us their system of numbering which has all but replaced the cumbersome Roman numerals. They also developed the science of chemistry as applied to medicine, and considerably improved the art of dispensing by the introduction of such elegant preparations as rose and orange water. To the Arabians we owe the introduction of the idea of the legal control of qualifying examinations for admission to the medical profession, and though the idea of establishing hospitals did not originate with them, they were responsible for the establishment of many these institutions.”⁶

The foundation for medical practice in European countries was set by the work of Arab medical doctors and scholars also laid. Prior to the era of Islam, medical treatment was basically given by clerics in clinics and extensions to sanctuaries. Most hospitals of Arab origin were hubs of medical education and research as well as precursors several beliefs plus constructs that are observed in contemporary hospitals, including separate wards for both genders, individual as well as established hygiene, medical histories, and dispensaries.

The influence of Islamic medical research done during the years 800 and 1450 on Western science is rarely acknowledged. It can be argued that in the present day, the medical practices of the West would not look like they do now if the heritage of Islamic medical researchers of Baghdad, Cairo, Cordoba, and so on.

With the increase in the outreach of Islam into areas other than Saudi Arabia such as Iran, Egypt and Syria, Muslims met other civilizations and centers of hubs of learning. Consequently, scholars and researchers translated major treatises on philosophy and various areas of science from languages as varied as Sanskrit, Greek, Pahlavi, Syriac, into Arabic. The founding of the Bait-ul-Hikma (House of Wisdom) in 830 during the Abbasid Caliphate in Baghdad. Due to this Arabic gained the status of the most valuable language of research and publication of the world for numerous centuries and conserved expertise.⁷

In addition to integrating and distributing the knowledge from diverse cultures, Arab scholars put forth various crucial and valuable scientific and technological developments in fields astronomy, architecture, mathematics, metallurgy, chemistry, agriculture, and textiles. Some of the major methods they created including the antiseptic use of alcohol, crystallization, and distillation.⁸

Through the pages of history, it is evident that the contribution of Muslims is eminent in different fields and Science is one among them and Muslim's contribution deny this assumption that they only have translated the Greek texts. It is true that Muslims have taken benefit from Greek text, and they have translated it, but they have not followed them blindly. They thoroughly examined, experienced, and sorted out what was beneficial and rejected useless ideas. This process was authenticated in such a way that it changed the entire shape of old Greek science into a new existing medical science.⁹

Muslims in the field of Medicine:

The contribution of Muslims was enormous in the field of medicine. Following description about the work of Muslim scientists will describe that how important were this invention.

1. Medicine:

The contributions that Muslim's scientists have made in the field of drugs and therapeutic agents is not only great, but it is also valuable. The following contribution will show how important and immense it was:

Abu Ali al-Husayn ibn Abd Allah Ibn Sina (AD 980-1037):¹⁰

Ibn Sina is known as the father of early modern medicine, especially for his contribution in systematic experimentation and quantification into the study of physiology and for his discovery of the contagious nature of infectious diseases. He also introduced the concept of quarantine to limit the spread of contagious diseases. He also introduced the experimental medicine, evidence-based medicine, clinical trials, randomized controlled trials, efficacy tests, clinical pharmacology, neuropsychiatry, risk factor analysis, and the idea of a syndrome. He also emphasized on importance of dietetics and the influence of climate and environment on health. He is also considered as the father of the fundamental concept of momentum theory in physics and regarded as a pioneer of Aromatherapy.¹¹

Ibn e Sina's famous work is *The Canon of Medicine* (القانون في الطب) a 14-volume book which was taught as a medical text in Europe and the Islamic world until the 19th centuries. In this book Ibn Sina has introduced the systematic experimentation and quantification into the study of physiology, and discovered the contagious diseases and sexually transmitted diseases, the introduction of quarantine to limit the spread of infectious diseases, the introduction of experimental medicine, clinical trials, neuropsychiatry, risk factor analysis, and the idea of a syndrome in the diagnosis of specific diseases, and hypothesized the existence of microorganisms.¹² *The Canon of Medicine* was the first book dealing with experimental medicine, evidence-based medicine, randomized controlled trials, and efficacy tests, and it laid out some rules and principles for testing the effectiveness of new drugs and medications, which still form the basis of clinical pharmacology and modern clinical trials.¹³

George Sarton a famous writer in History of Science, admired Al-Qanun fi Tibb of Ibn-e-Sina and recognize this book as a great encyclopedia of Medicine and a treatise on Cardiac Drugs.¹⁴

Ali Bin Rabban al Tabari (AD838–870):

Ali bin Rabban al-Tabari, was the first historical author of Medieval Islamic medicine, in his world-famous book "*Paradise of Wisdom*" (فردوس الحكمة) which consists of 360 chapters, he summarized the various branches of medicine. His book won the value of first large compendium of its kind in Islam in which he introduced different fields like pathology, pharmacology, and diet.¹⁵

Abu Bakr Muhammad bin Zakariya Al-Razi (AD 846–930):

Razi known as the first clinical and observational physician of Islam after along Ibn e Sina both were influential scientists and got the fame in the East and the West. Razi worked as the director of the hospital in the city of Rai, and Ibn e Sina the director-in-chief at the main hospital at Baghdad and gained much practical experience, which played an important part in making him the greatest clinician of the medieval period.

Al-Judari wa al-Hasbah, the most popular work of Razi in which he for the first time describes smallpox. He also describes the differences between smallpox and measles. The book "*Al-Judari wa al-Hasbah*" was translated more than a dozen time in Latin and other languages. As a Chief physician His major contribution was the discovery of "**allergic asthma**," he also wrote scholarly articles on allergy and immunology.¹⁶

Written contribution of Razi:

Razi's most popular and famous books are the following:

1. The Virtuous Life (al-Hawi).

One among the world-famous books of Razi which is considered as a through medical encyclopedia, in nine volumes - known in Europe as The Large Comprehensive or Continents Liber. In this book Razi criticize some Greek philosophers like Aristotle and Plato and describe his innovative ideas on different subjects. Because of his deep knowledge in the field of Medical Science he is known as the medical doctor of his age.¹⁷

2. A medical adviser for the public (من لا يحضره الطبيب)

Razi wrote a general home remedial manual for common people. Razi especially dedicated this book for the traveler and poor to treat their common ailment in case if the doctor is not available. This book is a basic source of pharmacy especially similar books got great fame in medieval era of Muslim Scientists.

3. Doubts About Galen (شكوك جالينوس)

One of the Al-Razi's mind blowing work which depicts his intellectual capabilities in a distinguished way. He rejected many claims made by the Greek physician about pediatric diseases. He is considered as father of pediatrics. He dealt with pediatrics as an independent field of medical science. He wrote a specific book with the title: The "Diseases of Children"¹⁸

Abu Rayhan Muhammad bin Ahmad al-Biruni (AD 973-1048):

Al-Biruni's book "Kitab al-Saidana fi al-Tibb" known as an extensive medical and pharmacological encyclopedia, In the field of biomedical sciences. This book presents a detailed description of which Islamic medicine and synthesize it from Indian medicine. His medical investigations included one of the earliest descriptions on Siamese twins.¹⁹ This book is a botanical study of many minerals and herbs.²⁰

Ibn al-Baitar (AD 1248):

Ibn al-Baitar was also a well-known Muslim scientist. He is considered one of the greatest botanists; however, he has also marked excellence in the field of Medicine. His major contributions are *Kitab al-Jami fi al-Adwiya al-Mufrada* (كتاب الجامع في الأدوية المفردة) and *Kitab al-Mughni fi al-Adwiya al-Mufrada*.²¹ (كتاب المغنى في الادوية المفردة)

Al-Kindi (AD 801-873):

Al-Kindi was known as a philosopher, physicist scientist, astrologer, cosmologist astronomer etc. There are more than 30 remarkable books attributed to him in the field of medicine, in which he was partly influenced by the ideas of Galen, and partly by his own personal experience and other Muslim physicians in his time. Al-Kindi's, for the first time demonstrates the application of mathematics and quantification to medicine, particularly in the field of pharmacology.²²

In his *Treatise on Diseases Caused by Phlegm*, he provided the first-hand scientific explanation and treatment for epilepsy in his *Aqrabadhin*

(*Medical Formulary*), he prepared many pharmaceutical preparations simply from drugs derived mostly from botanical sources as well as animal and mineral.²³

Ibn-Rushd (AD 1126-1198):

A medical encyclopedia containing general medicine was written by Ibn Rshhd called *Kulliyat* ("كليات"), later translated in Latin and other languages as *Colliget*. He also compiled the works of Galen and wrote a commentary on *The Canon of Medicine* (*Qanun fi 't-tibb*) of *Ibn Sina* (980-1037).

In urology, He identified the issues of sexual dysfunction and erectile dysfunction and was among the first to prescribe medication for the treatment of these problems.²⁴

Ibn al-Jazzar (AD 979):

Ibn al-Jazzar is also a great Physician. He devoted his life for the study and practice of medicine. He was also a very innovative author in the field of medicine, his writings earned great fame and made him very influential in medieval Western Europe. His famous book "*Kitab al-adwiyah al-mufradah*" (Treatise on Simple Drugs) was translated into Greek, Latin and Hebrew and was copied several times. But its Latin translation by Constantine, under the title "*Liber de gradibus*", was so famous that it became one of the most popular pharmacopoeias in the Latin West.

Another renown work was His *Tibb al-fuqara ' wa al-masakin* (*Medicine for the Poor*) which represents a literary topic which became especially popular during the Middle Ages.²⁵

Ibn al-Nafis (AD 1213-1288):

A remarkable contribution to the field of Medicine “ (الشامل في الطب) (*The Comprehensive Book on Medicine*) by Ibn al-Nafis is, a prominent medical encyclopedia which he wrote after completing his “*Commentary on Anatomy in Avicenna's Canon*” in 1242. Even in its incomplete form, it is considered as largest known medical encyclopedias in history and was much larger than the more famous *The Canon of Medicine* by Ibn Sina. But unfortunately, only several volumes of *The Comprehensive Book on Medicine* have survived.²⁶ He also wrote a short book on Medicine with titled "*Al-Mujaz fi al-Tibb* (المجيز في الطب). He introduced the use of vinegar for ear infections, which is still used in modern times. His intellectual work

also includes also wrote “the *Risalat al-A'ada'a* () الرسالة الأعضاء and *Al-Shamil fi al-Tibb* (لتشامل في الطب)²⁷ .

Ibn Zuhr (AD 1091-1161):

Ibn Zuhr’s famous book “*The Method of Preparing Medicines and Diet*”, he for the first time he used a silver needle for performing the first parenteral nutrition of humans and described it in his book.

He also introduced the drug therapy and medicinal drugs for the treatment of specific diseases like other Muslim scholars. He also used extensive ways of practical and careful observations.

2: Physiology:

Physiology is a field of medical science that deals with the bodily functions of living organisms. Like physiology of Heart etc.

There are number of Muslim scientists who marked significant contribution to this branch of medical science.

Al-Razi:

Al Razi’s skills in prognosis, and analysis of the symptoms of a disease, its manner of treatment and cure, have made him a well-known physician. His case studies celebrated among later physicians. Razi himself recorded some of the more unusual cases he encountered during his medical practice.²⁸

Ibn Nafis:

Ibn Nafis was a Physician in medieval period. In 1236, he moved to Cairo, Egypt and worked there at the Al-Nassri Hospital, and subsequently at the Al-Mansouri Hospital, where he became the "Chief of Physicians".

In circulatory system, he improved the theory of Galen and Ibn Sina.²⁹

Ibn Nafis also describes about pulmonary circulation which was a new explanation in his time. Based on his anatomical knowledge, Ibn al-Nafis stated that: In describing the anatomy of the lungs, Ibn al-Nafis stated:

"The lungs are composed of parts, one of which is the bronchi; the second, the branches of the arteria venosa; and the third, the branches of the vena arteriosa, all of them connected by loose porous flesh."

Ibn al-Nafis' next most important discovery is coronary circulation, the second phase of the circulatory system. He was the first to realize that the nutrition of the heart is extracted from the small blood vessels passing through its wall. He wrote:

"Again his [Avicenna's] statement that the blood that is in the right side is to nourish the heart is not true at all, for the nourishment to the heart is

from the blood that goes through the vessels that permeate the body of the heart..."-

Ibn al-Nafis discovered a precursor to the "capillary circulation in his assertion that the pulmonary vein receives what comes out of the pulmonary artery, this being the reason for the existence of perceptible passages between the two." Capillary circulation was not known in Europe for several centuries until Marcello Malpighi in 1661.

Ibn al-Nafis quotes another error made by Galen, who believed that "blood reaches the brain itself at the section called forebrain through the diameter which divides the vault longitudinally into two equal halves at the sagittal suture." Ibn al-Nafis criticized this theory and corrected it as follows:⁷¹

"The blood permeates first to the back ventricle (hindbrain) then to the other two ventricles. Dissection confirms this and disproves what they say. The permeation of arteries into the cranium is well known not to be from the front ventricle."

Ibn-e Nafis also corrected the earlier theory of Galen and Ibn-e Sina that "There is a bone present under the human heart. While correcting this theory he says:

*"This is not true. There are absolutely no bones beneath the heart as it is positioned right in the middle of the chest cavity where there are no bones at all. Bones are only found at the chest periphery not where the heart is positioned."*³⁰

He also corrected the old theory related to human muscles and referred it to his then upcoming encyclopedia "A Comprehensive Book on Medicine".

Ibn Zuhr (991-1061)

Ibn Zuhr was a physician who gave the first accurate descriptions on neurological disorders, including meningitis, intracranial thrombophlebitis, and mediastina tumors, and made contributions to modern neuropharmacology.³¹

3: Pharmacy

So far as pharmacy is concerned, the Muslim scholars provided valuable service in this field as well. They experimented the pharmacology of

rhubarb, camphor, and sienna. They used Hyoscyamus for medication. The following passages shed some light on some of their great contributions.

Al-Razi (Rhazes) (846–930):

Razi contribution was not only the compilation of medical text, but he also discovered the use of 'mercurial ointments'. He developed the apparatus like

as mortars, flasks, spatulas, and phials, which were used in pharmacies until the early twentieth century.³²

Ibn Sina (980-1037):

In the field of pharmaceutical sciences, Ibn Sina used experimental medicine, evidence-based medicine, clinical trials and clinical pharmacology, skin diseases and sexually transmitted diseases, nervous ailments, and the use of ice for fever treatment.³³

Ibn Sina was also a founder in the field of pulsology and symbology. He corrected the theory of Chinese and Galen about the pulse. That there was a unique type of pulse for every organ of the body and for every disease.

He was such an expert in pulsation that he was used to diagnose the symptoms disease only by feeling the pulse of a patient.³⁴

Abul Qasim (936-1013)

In the field of pharmacology, Abu al-Qasim al-Zahrawi laid the basis of sublimation and distillation for the preparation of medicine. His *Liber Servitoris* was very useful which provide a complete method of preparing simple and compound drugs.³⁵

Ibn Zuhr (991-1061) and his Drug therapy

Ibn Zuhr (and other Muslim physicians such as *al-Kindi*, *Ibn Sahl*, *Abulcasis*, *al-Biruni*, *Ibn Sina*, *Averroes*, *Ibn al-Baitar*, *Ibn Al-Jazzar* and *Ibn al-Nafis*) established drug therapy and therapeutic drugs for the treatment of specific diseases. His specialty was his extensive use of careful observation and experiments.³⁶

4: Diagnosis

The contribution of Muslim Scientists in the field of diagnosis was also very significant. They used the ancient ways of diagnosis and treatment in their period as well.

Ibn Sina (980-1037)

Ibn Sina dedicated a whole chapter of the “*Canon*” to discuss the blood pressure. He discovered some reasons of bleeding and hemorrhage and noticed that hemorrhage could be induced by high blood pressure because of higher levels of cholesterol in the blood. This led him to study the methods

of controlling blood pressure.³⁷

In the field of *etiology* and *pathology*, Ibn Sina revealed the contagious nature of infectious diseases like phthisis and tuberculosis. He discovered how the diseases spread through water and soil and described the spread of sexually transmitted disease.

Ibn Sina also distinguished between *mediastinitis* and *pleurisy* and provided a complete descriptions of skin diseases, perversions, and nervous ailments." Meningitis was also first described by him in *The Canon of Medicine*. He also defined the first known treatments for *cancer*.

In **physiotherapy**, Ibn Sina introduced the medicinal use of *Taxus baccata* L. He named this herbal drug as "*Zarnab*" and used it as a cardiac remedy. This was the first known use of a calcium channel blocker drug, which were not used in the Western world until the 1960s.³⁸

In **cancer therapy**, Ibn Sina identified cancer as a tumor and stated that a "cancerous tumor progressively increases in size, the destructive cells spread their roots which insinuate themselves amongst the tissue elements. Another method for treatment of cancer described by Ibn Sina was a **surgery**

He identifies that the removal of the veins and diseased tissue is helpful. He also introduced cauterization for the affected area.³⁹

Ibn al-Baitar and his Cancer therapy

Ibn al-Baitar was the first to discover the first and earliest herbal treatment of cancer. He used “*Hindiba*” for the treatment of cancer. He identified it as having "anticancer" properties and which could also treat other tumors and neoplastic disorders. After recognizing its usefulness in treating neoplastic disorders, *Hindiba* was patented in 1997 by Nil Sari, Hanzade Dogan, and John K.Snyder.⁴⁰

5: Anatomy

Muslims did not accept blindly the Greek’s interpretations of anatomy of but scrutinized it thoroughly and then contributed to this field after many experiments. Some of their contributions is as follows:

Ibn Sina (980-1037):

Writings on anatomy in Ibn e Sina's "Canon of medicine" is scattered. It has been described in different sections regarding to illnesses related to certain body parts. It also included discussions on anatomy and diagrams of certain body parts.⁴¹

Ibn Nafis (1213–1288):

Ibn Nafis has a gigantic work in this field. His book *Sharh Tashrih al-Qanun Ibn Sina* (شرح القانون في الطب لأبي سينا) is considered one of the best scientific books in which he covers in detail the topics of anatomy, pathology, and physiology. In this work, his experimental approach to physiology is evident as he writes:

"...In determining the use of each organ, we shall rely necessarily on verified

examinations and straightforward research, disregarding whether our opinions will agree or disagree with those of our predecessors."⁴²

Yuhanna ibn Maswayh (777 - 857):

Another Great Muslim scientist *Yuhanna ibn Masawayh*, while doing his anatomical experiments he procured monkeys from Caliph *Mu`tasim billah*.

He operated them to get a thorough knowledge about human body.⁴³

6: Surgery:

Muslim scientists were famous for their contribution, not only in the field of medicine but they also have influenced the field of surgery. They are known for documenting and performing the surgical procedures. They also documented the intricate tools they used and invented.

Abu al Qasim, Al Zahrawi (AD936-1013):

who is known as the "father of operative surgery", he wrote a book (كتاب التصريف) In which he illustrated and guide towards the methods of surgery for example the procedure of a kidney stone removal. Other than that, he invented many surgical tools, in his book (كتاب التصريف) he introduced a collection of more than 200 surgical instruments, and described their usage, some of his invented tools are still used today like syringes, bone saws, forceps, and plaster casts.⁴⁴

He was the first to use incisions (cut) on patient's skin or flesh which is a standard procedure now a days. He also pioneered the cauterization and suturing methods. He also described neurosurgical diagnoses and treatment

like skull fractures, Head and spinal Injury and dislocation, subdural effusions, and headache etc.⁴⁵

He also explained a case study of a child suffering from hydrocephalus he stated that: "I have seen a baby boy whose head was abnormally enlarged with prominence of the forehead and sides to the point that the body became unable to hold it up".

Pediatric surgery was another field in which he gained a lot of fame, he discovered adenoids, harelip, ranula, urinary meats, hermaphrodites, and webbed fingers. He also discussed the different dimensions of hemophilia in a detailed manner.

His written contribution was very much admired in west after being translated by Rogerius Frugardi, Cremona and Ronaldus Parmensis and considered as most advance surgical text.⁴⁶

Conclusion:

In the light of above discussions and details we can conclude that Muslims not only laid the foundation of modern medical science, but they also excelled in many fields of it and guide the world towards the latest inventions in this field and someone who deny this contribution is not just and honest in his claim.

1. Al-Quran Surah Fussilat 41: Verse 53.

2 Browne, Edward Granville, and Edward Granville Browne. *Arabian medicine: The Fitzpatrick lectures delivered at the College of Physicians in November 1919 and November 1920*. Cambridge University Press, 2011.

3Ahmad, Wasim, Khaiser Rabee, and Mohd Zulkifle. "Arab and Muslim contributions to Medicine and Research A Review." *Bangladesh Journal of Medical Science* 16, no. 3 (2017): 339-345.

4 Muhammad Bin Ismail Al Bukhari, "*Sahih Al Bukhari*", (Dar us Salaam:1996) Kitab Al-Tibb, Baab Al shafa fi Thalath. Hadith No:5356.

5 Al Bukhari, *Sahih Al Bukhari*: Kitab Al-Tibb, Baab Ma Anzal lala hu. Hadith No 5354.

-
- ⁶ Campbell, Donald. *Arabian Medicine and its Influence on the Middle Ages: Volume I*. Routledge, (2013).
- ⁷ . Drabu, R., A. Nanji, and S. Greenfield. "Science and learning in Islam—a shared legacy." *Royal Institution of Great Britain, London 1* (2005).
- ⁸ Al-Hassani, S. T. "Thousand years of missing history." *Manchester, UK: Foundation for Science Technology and Civilization, Publication ID 4060* (2004).
- ⁹ Obaidullah, Muhammad. "Medical science and Islam: an analysis of the contributions of the medieval Muslim scholars." *Erişim adresi: https://www.researchgate.net/publication/270215891* (2007).
- ¹⁰ D. Gutas , " *Encyclopedia Britannica* ", Concise Online Version, (2006), "Avicenna", AND Koninklijke Brill and NV, Leiden, " *Encyclopedia of Islam* ": (1999). The Netherlands; Horne, Charles F, ed.
- ¹¹ Ericksen, Marlene. *Healing with aromatherapy*. McGraw Hill Professional, 2000., p. 9.
- ¹² Hosseinzadeh, Hossein, and Marjan Nassiri-Asl. "Avicenna's (Ibn Sina) the canon of medicine and saffron (*Crocus sativus*): a review." *Phytotherapy Research* 27, no. 4 (2013): 475-483.2003).
- ¹³ Tschanz, David W. "Arab roots of European medicine." *Heart Views* 4, no. 2 (2003): 9.
- ¹⁴ Sarton, George. "Introduction to the History of Science." (1962). http://en.wikipedia.org/wiki/Ibn_Sina
- ¹⁵ Nasr, Seyyed Hossein, and Giorgio De Santillana. *Science and civilization in Islam*. Vol. 16. Cambridge, MA: Harvard University Press, 1968.
- ¹⁶ <http://en.wikipedia.org/wiki/Al-Razi>
- ¹⁷ Emilie Savage-Smith, " *Medicine* ", in Roshdi Rashed, ed., *Encyclopedia of the History of Arabic Science*, (Routledge: London and New York, 1996), Vol. 3, p. 903-962.
- ¹⁸ see <http://en.wikipedia.org/wiki/Al-Razi>

-
- ¹⁹ Zahoor, Dr. A. *Abu Raihan Muhammad al-Biruni*, (Hasanuddin University, 1997).
- ²⁰ Scheppler, Bill (2006), *Al-Biruni: Master Astronomer and Muslim Scholar of the Eleventh Century*, (The Rosen Publishing Group, 2006), pp. 42.
- ²¹ Diane Boulanger (2002), *The Islamic Contribution to Science, Mathematics and Technology, OISE Papers*, in *STSE Education*, Vol. 3.
- ²² Felix Klein-Frank, *Al-Kindi*. In Oliver Leaman & Hossein Nasr. *History of Islamic Philosophy*. (London:Routledge, 2001), pp. 172.
- ²³ Plinio Prioreschi, "Al-Kindi, A Precursor of The Scientific Revolution", *Journal of the International Society for the History of Islamic Medicine*, 2002 (2): 17-19.
- ²⁴ A. Al Dayela and N. al-Zuhair (2006), "Single drug therapy in the treatment of male sexual/erectile dysfunction in Islamic medicine," *Urology* 68 (1), pp. 253-254.
- ²⁵
http://www.muslimheritage.com/day_life/default.cfm?ArticleID=437&Oldpage=1
- ²⁶ Fancy, Nahyan AG. "Pulmonary Transit and Bodily Resurrection: The Interaction of Medicine, Philosophy and Religion in the Works of Ibn al-Nafis (d. 1288)." PhD diss., University of Notre Dame, 2006.
- ²⁷ Benamer, Mohamed Hussein (17 June 2005). *Ibn Al-Nafis and Vinegar*. See: http://en.wikipedia.org/wiki/Ibn_al-Nafis
- ²⁸ see: <http://en.wikipedia.org/wiki/Al-Razi>
- ²⁹ Selin, Helaine, ed. *Encyclopaedia of the history of science, technology, and medicine in non-western cultures*. Springer Science & Business Media, 2013.
- ³⁰ OTAYA, S. "Ibn ul Nafis has dissected the human body, Symposium on Ibn al-Nafis." In *Second International Conference on Islamic Medicine: Islamic Medical Organization, Kuwait*.

-
- ³¹ Martin-Araguz, A., C. Bustamante-Martinez, and J. M. Moreno-Martínez. "Neuroscience in Al Andalus and its influence on medieval scholastic medicine." *Revista de neurología* 34, no. 9 (2002): 877-892.
- ³² see: <http://en.wikipedia.org/wiki/Al-Razi>
- ³³ Saad, Bashar, Hassan Azaizeh, and Omar Said. "Tradition and perspectives of Arab herbal medicine: a review." *Evidence-Based Complementary and Alternative Medicine* 2, no. 4 (2005): 475-479.
- ³⁴ Aydin, I. H. "Avicenna and modern neurological sciences." *Journal of Academic Research in Religious Sciences* 1 (2001): 1-4.
- ³⁵ Levey M. (1973), *Early Arabic Pharmacology*. from: <http://en.wikipedia.org/wiki/Al-Zahrawi>
- ³⁶ Ajram, Kasem. *The miracle of Islamic science*. Knowledge House, 1992.
- ³⁷ Aydin, I. H. "Avicenna and modern neurological sciences." *Journal of Academic Research in Religious Sciences* 1 (2001): 1-4.
- ³⁸ Obaidullah, Muhammad. "Medical science and Islam: an analysis of the contributions of the medieval Muslim scholars." *Erişim adresi: https://www.researchgate.net/publication/270215891* (2007).
- ³⁹ Patricia Skinner (2001), "Unani-tibbi", in *Encyclopedia of Alternative Medicine*, http://en.wikipedia.org/wiki/The_Canon_of_Medicine
- ⁴⁰ See: http://en.wikipedia.org/wiki/Ibn_al-Baitar
- ⁴¹ Masic, Izet. "Thousand-year anniversary of the historical book: "Kitab al-Qanun fit-Tibb"-The Canon of Medicine, written by Abdullah ibn Sina." *Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences* 17, no. 11 (2012): 993.
- ⁴² Iskandar, Albert Z., "Ibn al-Nafis", in *Dictionary of Scientific Biography*, (1974) vol. 9, pp. 604.

⁴³ Mirza, Mohamad and Iqbal Siddiqi, *Muslim contribution to science*, (New Delhi: Adam Publishers & Distributors, 2003), p. 192.

⁴⁴ Martin-Araguz, A., C. Bustamante-Martinez, and J. M. Moreno-Martínez. "Neuroscience in Al Andalus and its influence on medieval scholastic medicine." *Revista de neurología* 34, no. 9 (2002): 877-892.

⁴⁵ Al-Hadidi, Khaled. "The Role of Muslem Scholars in Oto-rhino-Laryngology." *The Egyptian Journal of ORL* 4, no. 1 (1978): 1-15.

⁴⁶ Makki, A. I. *Needles & Pins*, *AlShindagah* 68, (Januray-February 2006).