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Muslim heritage in medicine: A concise review on Greco-Arabic contribution

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Abstract

The presented review was an attempt to share the contribution of Greco Arabic Muslim scientists in the field of medicine. In this regard, al-Andalusi, al-Antaki, al-Baghdadi, al-Jawhari, al-Kindi, al-Nafis, al-Razi, al-Tabari, al-Zahrawi, Ibn Abdallah Ibn Idris al Qurtubi, Ibn al-Jazzar, Ibn al-Baitar, Ibn al-Haitham, Ibn El-Quff, Ibn Haiyan, Ibn Sina, Ibn Wahshiyyah and Ibn Zuhr with their contribution has discussed.

Keywords: Greco-Arab, medicine, Muslims

Introduction

Greco-Arab and Islamic medicine, refers to medicine developed during the “Golden Age of the Arab–Islamic Empire”, which extended from Andalusia (Spain) and Maghreb states (North Africa) in the west to Central Asia and India in the east, with the central lands of Egypt, Bilad al-Sham (Greater Syria), and Iraq playing an important role. It spanned a period of roughly nine centuries, from the middle of the seventh to the end of the fifteenth century, by which time it had broken up into three distinct empires, the Ottoman, the Safavid, and the Mughal. Islamic medicine was initially built on tradition, mainly the theoretical and practical knowledge developed in Arabia, Mesopotamia, Persia, Greece, Rome, and India. The founder of the Arab–Islamic medicine is believed to have been the Holy Prophet (Peace Be Upon Him) himself^[1]. The statement of Holy Prophet (Peace Be Upon Him) that “there is no disease that Allah has created, except that He also has created its treatment” encouraged Arabs and Muslims to engage in medical research and seek out a cure for every disease known to them^[2]. Arabs and Muslims were known to have advocated the traditional medical practices of the Prophet’s time, such as those mentioned in the Quran and Hadith. Later on, Arab and Muslim scholars translated the voluminous writings of Galen and Hippocrates, as well as writings of the Indian physicians Sushruta and Charaka and the Hellenistic scholars in Alexandria, from Greek and Sanskrit into Arabic and then produced innovative medical knowledge and practice based on those texts.

Arab and Muslim scholars systematically organized the vast and sometimes inconsistent Greco-Roman and Indian medical texts by writing encyclopedias and compendia. In addition, they made many of their own significant advances and contributions to medicine, notably in the fields of anatomy, botany, embryology, immunology, obstetrics, ophthalmology, pathology, pediatrics, physiology, psychiatry, psychology, pulsology, surgery, urology and pharmacy^[1]. In present review, the contribution of following Greco-Arabic Muslim scientist has shared with special reference of medicine.

1. Abu Nasr Sa'ed Al-Baghdadi (died 624 H).
2. Jabir Ibn Haiyan (Geber, died 803 AD).
3. Abu Yousuf Yaqub Ibn Ishaq al-Kindi (Alkindus, 800-873AD).
4. Al-Abbas ibn Said al-Jawhari (800-860 AD).
5. Abu al-Hasan Ali Bin Sahl Rabban al-Tabari (838-870AD)---Teacher of al-Razi.
6. Ibn Wahshiyyah the Nabataean (860-935 AD).
7. Abu Bakr Mohammad Ibn Zakariya al-Razi (Rhazes, 864–930 AD).
8. Ahmed Ben Jaafar Ben Brahim Ibn Al Jazzar (898-980AD).
9. Abul Qasim Khalaf Ibn al-Abbas al-Zahrawi (Abulcasis, 936–1013AD)--- Father of modern surgery ; Founder of cosmetic dentistry and orthodontics.
10. Sheikh Bu Ali Sina / Ibn Sina (Avicenna, 980–1037AD)--- The prince of physicians.
11. Abu Ali al-Hasan Ibn al-Haitham (Alhacen, 965–1040AD)---Father of modern optics.
12. Umayya Ibn Abi-l-Salt- al-Andalusi (1068-1134AD)

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13. Abu Marwan Abd al-Malik Ibn Zuhr (Avenzoar, 1091–1161AD)-- Father of experimental surgery.
14. Abu Abdallah Muhammad Ibn Muhammad Ibn Abdallah Ibn Idris al Qurtubi al-Hasani / Sharif (1099-1166AD).
15. Ziya al-Din Abdullah Ibn al-Baitar (died 1248AD)
16. Ibn al-Nafis (Annafis, 1210–1288AD) ---Father of circulatory physiology.
17. Abo El Farag Ibn El-Quff (1233-1286AD).
18. Daoud al-Antaki (David of Antioch, died 1599 AD).

1. Al-Baghdadi ^[3]

Abu Nasr Sa'id ben Abi Al-Khare ben Issa ben Al-Masihi was one of the remarkable people, the most imminent, and the elite between professors in the manufacturing of medicine. Here we will discuss about his publication.

Kitab Intikhab al-iqtidab: Al- Baghdadi mentions that the reason behind writing manuscripts is to be an introduction for the beginner and a reminder for those who finish medicinal sciences. In this book he also mentioned different group of medicines as antiemetic, anthelmintic, antiurolithiatic, diuretic hepatoprotective and laxative medicines. This book discussed a lot of medical subjects that can be classified as the following:

- a. Thorough in medicine.
 - b. Diseases and their reasons.
 - c. Medicines and rules for how to treat and use them.
 - d. The diversities between diseases.
 - e. Commandments
- a. **Thorough in medicine:** He talked about the humors, the elements, the organs, blood vessels and their kinds then he talked about the formation of bones for the human body as well as the cartilages, the joints and the muscles.
 - b. **Diseases and their reasons:** He talked about the types of diseases and their kinds, their reasons and sign and symptoms. He also talked about the effect of air, seasons, inhabitants, soil, and food on the body from one side and on the diseases from the other side.
 - c. **Medicines and rules for how to treat and use them:** He talked about the rules of choosing the medicines, and choosing the right time for using them. Then he talked about the types of medicines and their mixtures and strength and adopted rules when formulating medicines.
 - d. **The diversities between diseases:** He has mentioned the difference between catarrh and cold; epilepsy and spasm; vitiligo and leprosy has mentioned in this book.
 - e. **Commandments:** At the end, fantastic range of wills and tips essential in the management of patients have written as a set of rules that must be performed by a physicians before and during treatment of patients. He wrote,

“The power of the patient is stronger than the disease, there is no need then for a physicians or medicine but particularly the strengthening of the body's immune. Physicians first control pulse and the eyes of the patient. Pulse plays an important role in the knowledge of the condition of the heart, and the eyes and their focus gives us the situation of brain. If physician can treat the patient with food, there is no need for the drug. If you can treat the patient with mild medicine, there is no need for strong one. If you can treat the patient with one medicine, there is no need for more than one. Don't prescribe the drug before expert it. The experience of the drug should be check primarily on healthy volunteers. When you need to treat 2 diseases at same patient, you must begin deal with the

most dangerous one to save the life. When patient desire something like foods, drink, give him it. You must take care about the patient desire of method of treatment. You must relieve the patient's pain. You must know the whole clinical history of patient. You must know the disease before begin the medication”.

2. Ibn Haiyan ^[1]

He identifies poisons by their traits, natural origins, modes of action, dosages, and methods of administration and choice of antidotes for particular poison.

3. Al-Kindi ^[1]

Al-Kindi was a renowned ninth century Arab doctor who introduced the application of mathematics into medicine, particularly in the field of pharmacology. This includes the development of a mathematical scale to quantify the strength of drugs, and a system that would allow a doctor to determine in advance the most critical days of a patient's illness, based on the phases of the Moon.

4. Al-Jawhari ^[1]

Kitab al-Sumum

It is a five-volume manual on toxicology which discussed that how poisons can be detected by sight, touch, taste, or the toxic symptoms they cause. Descriptions are provided of poisoned drinks, foods, clothes, carpets, beds, skin lotions, and eye salves, as well as narcotics and universal antidotes.

5. Al-Tabari

Firdous al-Hikmat is one of the Al Tabari first ever medical encyclopedia which incorporates all the branches of medical science consists of seven parts. Some of them show his experience in surgery. He used the available known metal tools, made of iron, that were used for thermocautery, incisions, punctures, venesection, scarification and extraction of arrows ^[4].

- Part one: *Kulliyat-e-Tibb* throws light on contemporary ideology of medical science.
- Part two: Elucidation of human body organs, rules for keeping good health and comprehensive account of certain muscular diseases.
- Part three: Description of diet to be taken in disease and health.
- Part four: All diseases from head to toe. It further contains twelve chapters. I) General causes of disease eruption ; II) Diseases of head and brain, III) Diseases related to eye, nose, ear, mouth and the teeth, IV) Muscular diseases (paralysis and spasm), V) Diseases of chest region, throat and lungs, VI) Abdominal diseases, VII) Liver diseases, VIII) Gall bladder and spleen diseases, IX) Intestinal diseases, X) Types of fever, XI) Miscellaneous diseases, XII) Pulse and urine examination
- Part five: Description of flavor, taste and color
- Part six: Drugs and poison
- Part seven: Deals with diverse topics. Discuss climate and astronomy. Also contain a brief mention of Indian medicine ^[1].

6. Ibn Wahshiyah

Al-Sumum wal-tiryaqat: It discusses the general human anatomy and the four humors, detailing how they are affected by purgatives and lethal drugs. He even warns against poisonous or poisoned matter and prescribes antidotes ^[1].

7. Al-Razi

a. *Al-Kitab al-Mansuri*

This 10-volume book discussed general medical theories, diet and drugs and their effect on the human body, mother and child care, skin diseases, oral hygiene, climatology and the effect of the environment on health, epidemiology, and toxicology [1]. The seventh volume dealt with general surgery and bone fractures included surgical treatment of umbilical and inguinal hernia, tumours of the breast, skin and legs and the removal of leg varices. In this volume, he also mentioned surgical tools used by him previously known as the cautery, hooks, needles, pricers, retractors, scalpels and scissors that were made of iron or copper. Some new surgical tools invented by him as for the removal of nasal polyp he used the knotted rope, which passed from the nose to the mouth. He also introduced different shapes of scalpels in surgery of the tumours, suture thread made of the intestine of animals, the catgut. He was first one to use pure alcohol for wound cleaning and dressing. The most marvellous addition is the use of the soporific sponge for inhalation anaesthesia. It was a sponge saturated with dissolved powder of *Papaver somniferum* L. (opium), *Hyoscyamus niger* L. (hyoscyamus) and *Mandragora officinarum* L. (mandragora), placed on the nose and mouth before any operation [4]. Razi further mentioned that *Masikul bawl advia* (*Acorus calamus*, *Alpinia galanga* and *Quercus incana*) are useful urinary incontinence [5].

b. *Kitab al-Jadari wa'l Hasbah, (The Book of Smallpox and Measles)*

Al-Razi considered smallpox to be basically an infection of the blood, in which the blood boils and releases vapors that get trapped in vesicle like blisters underneath the skin. He thought that the fluid in smallpox blisters was like immature blood being fermented and ripened into a richer blood, much like the making of wine, with the blisters being like bubbles found in wine [6]. This book clinically and scientifically distinguishes between smallpox and measles. He stated:

"The eruption of smallpox is preceded by a continued fever, pain in the back, itching in the nose and nightmares during sleep. These are the more acute symptoms of its approach together with a noticeable pain in the back accompanied by fever and an itching felt by the patient all over his body. A swelling of the face appears, which comes and goes, and one notices an overall inflammatory color noticeable as a strong redness on both cheeks and around both eyes. One experiences a heaviness of the whole body and great restlessness, which expresses itself as a lot of stretching and yawning. There is a pain in the throat and chest and one finds it difficult to breathe and cough. Additional symptoms are dryness of breath, thick spittle, and hoarseness of the voice, pain and heaviness of the head, restlessness, nausea and anxiety. (Note the difference: restlessness, nausea and anxiety occur more frequently with 'measles' than with smallpox. At the other hand, pain in the back is more apparent with smallpox than with measles). Altogether one experiences heat over the whole body, one has an inflamed colon and one shows an overall shining redness, with a very pronounced redness of the gums [1]."

c. *Al-Hawi Fi-Tibb*

A collection of medical notes that al-Razi had read and observations from his own medical experience throughout his life. *Al-Hawi Fi-Tibb* consists of 23 volumes that include

diseases of different body organs along with their diagnosis [7]. Views about polypharmacy He cautioned against unnecessary use of drugs, and particularly polypharmacy: He wrote, *"If the physician is able to treat with nutrients, not medication, then he has succeeded. If, however, he must use medication, then it should be simple remedies and not compound ones."* Unlike the polypharmacy promoted by some other Islamic authors in the 9th century, al-Razi rarely recommends compound remedies of few ingredients.

Treatment of gout: He wrote, *"Where gout is accompanied by high fever, the recipe contains seeds that cause diuresis without giving out much heat, such as those of white colchicum (*Colchicum autumnale* L.), water melon (*Citrullus lanatus* (Thunb.) Matsum. & Nakai) and cucumber (*Cucumis sativus* L.). These, in equal parts, are mixed with one third of a part of opium, and an oral dose of four dirhams (12g) of the mixture with the same amount of sugar is analgesic and effective within the hour. Where there is no high fever, the ingredients, in an oral remedy, are: colchicum (*Colchicum autumnale* L.), opium (*Papaver somniferum* L.), borax, colocynth (*Citrullus colocynthis* (L.) Schrad.), ammi (*Ammi majus* L.), aristolochia (*Aristolochia gigantea* Mart.), and mountain thyme (*Thymus serpyllum* L.)..... I have heard amazing accounts, amongst which the physician is prescribed for gout a potion prepared with two mithqals (4.5g) of colchicum, half a dirham (1.5g) of opium and three dirhams (9g) of sugar. The drug is said to be effective within the hour, but I need to verify this".*

Diagnosis of meningitis: He stated, *"When the dullness (thiqal) and the pain in the head and neck continue for three and four and five days or more, and the vision shuns light, and watering of the eyes is abundant, yawning and stretching are great, insomnia is severe, and extreme exhaustion occurs, then the patient after that will progress to meningitis (sirsâm) ... If the dullness in the head is greater than the pain, and there is no insomnia, but rather sleep, then the fever will abate, but the throbbing will be immense but not frequent and he will progress into a stupor. So when you see these symptoms, then proceed with bloodletting. Once I saved one group [of patients] by it, while I intentionally neglected [to bleed] another group. By doing that, I wished to reach a conclusion. And so all of these [latter] contracted meningitis [7]."*

Diagnosis of Tuberculosis: According to Al Razi *"To diagnose the patient of TB - give the patient meals in three different times and record the temperature, if the temperature rises, it is the confirm diagnosis of TB [8]."*

Deodorants and antiperspirant: In this book Al Razi has mentioned natural antiperspirant and deodorants (table-1). He also differentiates between odor remover and anti sweating agents. He wrote, *"To perfume body, one should coat his body with leaves of Cypress-tree (*Taxodium distichum* (L.) Rich.) and the oil of its flowers, and eat Cubebe Pepper (*Piper cubeba* Bojer.) and Cassia-tree (*Cinnamomum cassia* (L.) J.Presl.), in the morning before eating.....nothing can remove stinking sweat like Rehani Syrup i.e. grape juice (*Vitis vinifera* L.) with carnations (*Dianthus caryophyllus* L.), and eating Artichoke (*Cynara scolymus* L.) and Asparagus (*Asparagus officinalis* L.), and all plants that expel thick urine, like Sabin,*

which is very strange, if one has some of it every day. Then the smell of sweat will be as that of Sabin. The same applies to the smell of urine. So stink will be removed completely..... “By which the body is perfumed by its essence like spices and perfumes. Some of them block pores of the body, like burnt lead, alum, slag of silver and zinc. They all prevent sweat from armpit and feet, so there will be no stink Body should be rubbed by cooked wild-thyme (*Thymus glaber* Mill.), butchers broom (*Ruscus aculeatus* L.), rose (*Rosa canina* L.), sweet marjoram (*Origanum majorana* L.), moss (*Muscus arboreus*) and sweet flag (*Acorus calamus* L.)..... we take one ounce of cinnamon-tree (*Cinnamomum verum* J.Presl.) and Indian valerian (*Valeriana wallichii* DC.) and azzfar al-teeb (covering of a kind of shellfish), two ounces of each one, and half ounce of lake mud, graphite slag and washed ceruse (Venetian ceruse / white lead), one ounce of with judean wormwood (*Artemisia judaica* L.) and Roman valerian (*Valeriana officinalis* L.) and three ounces of saffron and dried rose. Then the dry components are crushed with butchers broom water and saffron, and dissolved by old rehani syrup and used (for odor removing and anti-sweating purpose)” [9].

8. Ibn Al Jazzar

Ibn al-Jazzar wrote a special book on the medicine and health of the elderly, entitled *Kitab Tibb al-Machayikh*. He also wrote a book on sleep disorders and another one on forgetfulness and how to strengthen memory, entitled *Kitab al-Nissian wa Toroq Taqwiati Adhakira*, and a treatise on causes of mortality entitled *Rissala Fi Asbab al-Wafah*.

a. *Kitab Zad al-Musafir wa qut al-Hadir* (Provision for the Traveller and Nutrition for the Sedentary)

This book started from the classification of diseases, and their names in Persian, Greek and Syriac together with their popular synonyms [10]. This book provided the earliest treatment for dental caries. He wrote, “With caries purging must take place first, and then the teeth can be filled with gallnut (*Galla Chinensis* Mill.), buckthorn (*Rhamnus cathartica* L.), terbinth (*Pistacia terebinthus* L.) resin, cedar (*Cedrus atlantica* (Endl.) Manetti ex Carrière.) resin, myrrh (*Commiphora myrrha* (Nees) Engl.), pellitory (*Parietaria judaica* L.), *Anacyclus pyrethrum* (L.) Lag., *pyrethrum* (*Tanacetum cinerariifolium* (Trevir.) Sch. Bip.), chamomile (*Matricaria chamomilla* L.) or Mount Atlas daisy (*Anacyclus depressus* Ball.) and honey, or fumigated with *colocynthis* (*Citrullus colocynthis* (L.) Schrad.) root.” He also recommended arsenic compound in his prescription for holes in the teeth, as well as against dental caries, loosening, and relaxing of the nerves as a result of too many fluids [1].

b. *Itimad fi Al Adouia al Mofrada* (Basic treatise on simple medicines)

This book records 280 simple medicaments with their therapeutic properties, their faking (crude drug adulteration) and possible substitutions. Ibn Al Jazzar describes more than thirty pharmaceutical formulas, some of which are still in use today [10].

c. *Siassat Essibyane wa tadbiruhum* (Infant and child care and the education of children)

The book is considered the first complete work on paediatrics and child care. This treatise was re-published in 1968 by the Tunisian Publishing House [10].

9. Al-Zahrawi

Al-Tasrif

This 30 volumes book highlighted on surgery, medicine, orthopedics, ophthalmology, pharmacology and nutrition. It contains 200 drawings of surgical tools ranging from a tongue depressor to an elaborate obstetric device, in use or developed by him. In medicine, he was the first to describe in detail the unusual disease hemophilia [11]. In the section of pharmacology and therapeutics, he covers areas such as cardiac drugs, cosmetology, dietetics, emetics, laxatives, materia medica, weights and measures and drug substitution. Discussed the preparation of various herbal-based medicines and described in detail the application of such techniques as sublimation, decantation and distillation to prepare herbal formulations [1]. It extensively discussed about fractures of nasal bones to the vertebrae and their treatments based on the operations performed by him. He optimized several delicate operations, including removal of the dead fetus and amputation. Al-Zahrawi was the inventor of three notable surgical tools as an instrument for internal examination of the ear, urethra, and (iii) an instrument for removing foreign bodies from the throat. This book first time shared method for reducing a dislocated shoulder. Fully described tonsillectomy, tracheotomy and craniotomy performed on a dead fetus. This book also explained how to use a hook to extract a polyp tiom the nose, how to use a bulb syringe he had invented for giving enemas to children and how to use a metallic bladder syringe and speculum to extract bladder stones. The surgical uses of catgut and curette, forceps, ligature, scalpel, retractor, surgical spoon, surgical needles, surgical hook, surgical rod, speculum, bone saw and plaster are mentioned in the book [1]. The cautery tools were of different shapes and sizes. They were of single or double blade, forked, oliver or myrtle-leaf shaped. Their tips were slender, punctuate, crescent, rounded or lenticular. The scalpels were of different sizes and shape to suit the incisions at different parts of the body. The forceps were of the wide or pointed tip to be used for catching wound edges, palpation of the lesions and foreign body extraction. The hooks were made of hard metals, with a single, double or triple curved ends. They were of different sizes to be used in the different sites of the body. The dental tools were small fine scalpels, pincers, scrapers, teeth extractors and silver or gold wire for bridging mobile teeth. Trocars, made of iron or copper, with hallow cannulas were used to withdraw fluid from the abdomen, chest or cystic swellings. Pincers made of hard metal were used to crush urinary calculi, extraction of diseased bones and the extraction of the dental roots. In obstetric surgery, vaginal speculum made of metal or wood with a metal screw was used beside the classical surgical tools. A large toothed metal crusher was also used for the extraction of dead infants. In orthopedic surgery, most of the previously mentioned tools were used beside the hammers, hand saw and wood splints [4]. He wrote, “For the skilled practitioner of operative surgery is totally lacking in our land and time and is nothing left of it except a few traces in the books of ancients, therefore, I decided to revive this art by expounding, elucidating, and epitomizing it in this treatise, and to present the forms of the cauterizing irons and other operative instruments.” He developed the technique of preparing artificial teeth and using them to replace defective teeth. It also discussed the problem of nonaligned or deformed teeth and how to rectify these defects. The achievements of Al - Zahrawi in the field of oral surgery are as follows [12].

a. On scraping the teeth with iron instrument

Al-Zahrawi links between the scaling of teeth and the healthy position of teeth and gums.

He wrote,

“The patient should sit before you, putting his head in your lap; and you should scrap the teeth or molars on which you can discern crusts or gritty substance, till nothing remains; do them all in the like manner, black, green, yellow, and the rest, until they are all gone. If they disappear at the first scraping, good; but if not repeat the scraping on the following day and the second and the third until you attain your purpose. You should know that molars need scraping-tools of many diverse forms and shapes according to the character of your under taking; for the tool with which the inner surface of the teeth is scraped differs from the tool with which the outer surface is scraped, and that for scraping between the teeth is different again.”

b. On the extraction of teeth

He assured that the tooth is very noble substance you should treat it carefully. He concentrated to make all the efforts to treat the tooth, and then to be sure of the one you should extract. All these things are great practices of him. and he said about this subject

“When there is no means of avoiding extraction, you should be very sure of the painful tooth, then cut away all round the tooth with a scalpel having a certain measure of strength, until the gum is separated all round. Then, with your fingers, or with a pair of fine forceps, first move the tooth slowly and gently till you stir it, then get a good grip on it with a pair of large forceps, holding the patient’s head between your knees so that it does not move. Then draw the tooth straight out so as not to splinter it.”

c. On the extraction of roots and broken pieces of mandible

He wrote, *“When in extracting a tooth, a broken-off root remains behind, you should apply to the place cotton wool soaked in butter for one or two days to soften it, then insert the tongs or forceps with stork-bill jaw which Al-Zahrawi named “jift” or “kalalib.”*

d. On the sawing-down of teeth growing on top of others

Al-Zahrawi put the first support of cosmetic treatment of teeth. He stated, *“when teeth grow in other than their natural place the appearance is very bad, especially when it occurs in women or slaves. So you should examine; if the tooth has grown out behind another tooth and it is impossible either to saw or file it down, then extract it. But if it be attached to another tooth, cut it down with an instrument.”*

e. On interlacing loose teeth with silver or gold wire

It’s important to say that the technique which al-Zahrawi advises to practice in this case is very similar to what we do now. The description on wiring loose teeth is very interesting. He said, *“When the front teeth are loosened by some blow or fall and the patient cannot bite, you should treat them with styptic medicines, the technique in this case is to bind the teeth with gold or silver wire. Gold is the better; for silver oxidizes and corrodes after some days, but gold remains forever in its state and does not suffer this change. The wire should be moderate in thickness in accordance with the distance between the teeth”* [1].”

10. Ibn Sina***Al-Qanun fi al-Tibb, or The Canon of Medicine***

Ibn Sina summarized Hippocratic and Galenic theories and practices, on his own experimental observations and innovations and recommended the new drug testing on animals and humans prior to general use. In this way laid out the basic rules of clinical drug trials. It mainly divided into five books, deals with general principles, diseases of body organs and local diseases spread to other body parts. It also contains 760 medicinal plants and 700 herbal preparations along with their properties, indications and mode of actions and the medicines that could be derived from these plants. The highlights of the book are as follows.

a. Circulatory system: He put forward the concept of coronary circulation and wrote, *“His [Avicenna’s] statement that the blood that is in the right side nourishes the heart is not true at all, for nourishment of the heart is actually from the blood that goes through the vessels that permeate the body of the heart.How the aorta works, noting that its three valves prevent blood from rushing back into the heart after the heart completes contracting..... Every beat of the pulse comprises two movements and two pauses. Thus, expansion pause and contraction pause. The pulse is a movement in the heart and arteries . . . which takes the form of alternate expansion and contraction”*.

He confirmed that nerves are critical message paths for virtually all physical functions, in particular muscular contractions, concluding that pain is transmitted from its source via the nerves [1, 13].

b. Urinary system: He wrote, *“In the bladder neck, there is a fleshy and sensitive material which is adjacent to the muscles related to the bladder..... The bladder has 2 layers: the internal and external layers. The internal layer is undercoat of the bladder and its power and firmness is twice as much as the external layer, because the internal layer has to being touch with the astringent urine..... The causes of UI are laxity of bladder wall or abnormal hot temperament of bladder, inflammation in surrounding structures of bladder and dislocation of the bladder”* [5].

c. Dentistry: He provided his own treatment for dental caries, stating that carious teeth should be filled with cypress, grass, mastix, myrrh, or styrax, among others, with gallnut, yellow sulfur, pepper, camphor, and with drugs for pain relief, such as arsenic or wolf’s milk (*Lycogala epidendrum* (Linn.) Fr.) [1] shown in table-1.

d. Geriatrics: *Al Qanoon* was the first book to offer instruction for the care of the aged. In a chapter entitled “Regimen of old age,” He wrote, *“Old folk need plenty of sleep. Time spent on the couch should be liberal—more than is legitimate for adults.....After waking up, the body should be anointed with oil to stimulate the sensitive faculties.....The factors to consider in regard to exercise in old people are the various bodily states of different persons. If the body is healthy, it can perform tempered exercises, but if one part of the body is infirm, then that part should not be exercised until after the rest..... They must avoid all hot, sharp or desiccative foods, such as dishes made with vinegar, salt, hot aromatics and pickles. Milk is good for the aged, being*

nutritious and humectant in nature. Food with a laxative action is the most appropriate for the elderly.”

Ibn Sina wrote that elderly should be given food in small amounts at a time and that they can have two to three meals a day, divided up according to the digestive powers and general condition of the old person in question [1].”

e. Psychology: In the 3rd volume of *Al Qanoon*, he mentioned close relationship between emotions and the physical conditions and physical and psychological effect of music on patients. Ibn Sina reputed to have firstly diagnosed and described love sickness in a Prince of Jurjan who lay sick. Ibn Sina noted a fluttering in the Prince pulse when the name and address of his beloved was mentioned. Then he recommended that unite the sufferer with the beloved. He stated,

“We have to understand that the best and effective remedy for the treatment of patients should be through the improvement of the power of the human body in order to increase its immune system, which is based on the beauty of the surroundings and letting him listen to the best music and allow his best friends to be with him [1].”

f. Anaesthesia: Ibn Sina used to administer sedatives and analgesic mixtures before a surgical operation. He wrote, must have a drink prepared from a mixture of mandragora (*Mandragora officinarum* L.) and other sleeping drugs. Other plants used for the same purpose were: Indian cannabis / Hashish (*Cannabis indica* Lam.), opium poppies / EI-Khishkash (*Papaver somniferum* L.), hemlock / Shweikran (*Conium maculatum* L.), and hyoscyamus (*Hyoscyamus niger* L.) [14].

g. Surgery: In his surgical practice he added new tools and improved the manufacture of some tools by introducing silver and gold. He is the pioneer physician who invented the first endotracheal tube, made of gold, to be introduced through the mouth to save suffocating patients. In thermo-cautery he used tools made of gold and presented a new innovation of a cautery tool enveloped by a tube, to be used inside the nose, mouth or rectum. In tumour surgery he used different sizes of dilators, hooks, needles, scalpels and scrapers. In oral and pharyngeal surgery he used tongue depressors, hooks, scalpels, extractors and grasping forceps. In orthopaedic surgery he used extractors, pincers, scalpels scissors and hand saw beside the wood splints to support fractures and dislocations [4].

h. Pediatrics: He devoted a part to describe the children’s bringing up and their diseases. This part consists of four chapters. The first chapter devoted to the description of management of the new born until the child starts to walk. In this chapter he describes all the issues which are necessary to be carried out for every new born baby. In the second chapter, he stresses on the necessity of doing all efforts to breastfeed the new born. Regarding weaning he says that it should be gradually and first light food should be given such as soup. In the continuation of this description he also talks about the condition in which child should not be breastfed. Ibn Sina recognized the importance of breast milk in infant feeding. According to him “mother’s milk is most suitable and better adapted for the infant [15].

i. Osteoarthritis: He has described in detail regarding the definition, etiopathogenicity, clinical features, diagnosis, management and treatment of Osteoarthritis (*Wajaulmafasil*) in the IVth Volume [16].

j. Miscellaneous diseases and their diagnostics: Discussed breast cancer, chronic nephritis, facial paralysis, meningitis, rabies, tumors, stomach ulcer, types of hepatitis their causes and treatments; dilation and contraction of the pupils with their diagnostic value; symptoms and complications of diabetes; contagious nature of infectious diseases, such as tuberculosis and sexually transmitted diseases. He wrote:

“.....Therefore in medicine we ought to know the causes of sickness and health. In addition, because health and sickness and their causes are sometimes manifest, and sometimes hidden and not to be comprehended except by the study of symptoms, we must also study the symptoms of health and disease [1].”

Al-Advia Wal-Qalbiya [17]

In this book he stated, *“Heart is made up of special fibres, though not affected by minor injuries. Its longitudinal fibres, absorb nutrients and oxygen and its oblique and horizontal fibres to hold nutrients and oxygen. These discrepancies of fibres help the heart performing its normal activities”*.

He has classified the cardiac condition in two ways: (i) *Zof-e-Qalb* or Cardiac asthenia (weakness of the heart) and (ii) *Zaiyiq Sadr* or Dyscardia (pressure felt on the chest). Ibn Sina has formulated distinctive parameters “*ISTEDLALE AHWAL QALB*” for the diagnosis of cardiac ailments through pulse (nabz), respiration (tanaffus), built of the chest (khilqat-e-sadr), hair on the chest (sharus sadr), palpitation (malmas), manner of the patient (akhlaq), the energy status of the body (quwat-wa-zof-e-badan) and emotional and psychological attitude (auham). He further advised for heart patient about light morning walk, use of cold water, easily digestible foods (*Ghiza-e-Mahmoodul Kaimoos*) and to avoid any strenuous work. Ibn Sina has categorized the “*Al-Advia Wal Qalbiya*” (cardiac drugs). According to Ibn Sina drugs interact with human body in two ways: (i) Conditional drugs attached with tissues (diuretic, diaphoretic, purgative, haemostatic) (ii) Unconditional, to be common and not related with tissues. (attenuant, resolvent, detergent, calorifacient, deobstruent, relaxant, abluscent, diluting agent, absorbent etc.). He has mentioned cardiac drugs along with their actions (Table-1).

11. Ibn al-Haitham

Kitab al-Manazir

Firstly describe the anatomy of the eye and gave a scientific explanation of vision process. This book dealt in depth with the theory of various physical phenomena such as shadows, eclipses, and the rainbow and speculated on the physical nature of light and described Laws of refraction. He contradicted Ptolemy’s and Euclid’s theory of vision that objects are seen by rays of light emanating from the eyes. According to him, the rays originate in the object of vision and not in the eye [1].

12. Al-Andalusi

Al-Adwiah al-Mufrada

In this book al-Andalusi enlisted herbal drugs successfully used to treat oral complaints mostly by rinsing the mouth with their aqueous extracts (Table-1).

13. Ibn Zuhr

a. Kitab al Tasir fi al-Mudawat wa al-Tadbir (Book of Simplification Concerning Therapeutics and Diet)

In this book he introduced experimental method into surgery. He employed animal testing in order to experiment with

surgical procedures before applying them to human patients. He also performed the first dissections and postmortem autopsies on humans as well as animals [1].

b. Kitab al-Iqtisad fi Islah al-Anfus wa al-Ajsad (Book of the Middle Course Concerning the Reformation of Souls and the Bodies)

This book summarized different diseases, therapeutics, and hygiene.

c. Kitab al-Aghziya (Book on Foodstuffs)

It describes different types of food and drugs and their effects on health [1].

14. Ibn Idris / Sharif

He was the renowned collector of medicinal plants. He has command to evaluate and authenticate the plants and given them the names in Greek, Hindi, Latin, Persian and Syrian languages became very helpful to the medical practitioners [1].

15. Ibn al-Baitar

a. Al-Jaame'-il-Mufradaat-al-Advia-wal- Aghzia

It is the encyclopedia of 1400 medicinal plants and vegetables along with their medicinal uses. Among these 200 plants were not known earlier. It refers to the work of 150 authors mostly Arabic and 20 early Greek scientists. He also has mentioned more than 70 drugs for *Wajaulmafasil* (osteoarthritis) in detail [16].

b. Kitab al-Mughni fi al-Adwiya al-Mufrada

It contains 20 different chapters listed with plants in accordance with their medicinal value in diseases of different body parts. Besides Arabic, Baitar has given Greek and Latin names of plants, and thus facilitating the transfer of knowledge [1].

16. Ibn al-Nafis

a. Sharah al Tashreeh al Qanoon (Commentary on Anatomy in Avicenna's Canon)

Firstly describe the pulmonary circulation, coronary circulation, and capillary circulation with true anatomy of the heart which form the basis of the circulatory system. He wrote: *"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..... The blood from the right chamber of the heart must enter the left chamber, but there is no direct pathway between them. The thick septum of the heart is not perforated and does not have visible openings as some people thought or invisible pores as Galen thought. The blood from the right chamber must flow through the vena arteriosa (pulmonary artery) to the lungs, spread through its substance, be mingled with air, pass through the arteria venosa (pulmonary vein) to reach the left chamber of the heart..... Arteries and the heart do not expand and contract at the same time, but rather the one contracts while the other expands"* and vice versa.

He also recognized that the purpose of the pulse is to help disperse the blood from the heart to the rest of the body. He completely rejected the Galenic theory of pulsation after his discovery of the pulmonary circulation. He developed his own Nevisian theory of pulsation after discovering that pulsation is a result of both natural and forced motions, and that the

"Forced motion must be the contraction of the arteries caused by the expansion of the heart, and the natural motion must be the expansion of the arteries. The primary purpose of the expansion and contraction of the heart is to absorb the cool air and expel the wastes of the spirit and the warm air; however, the ventricle of the heart is wide. Moreover, when it expands it is not possible for it to absorb air until it is full, for that would then ruin the temperament of the spirit, its substance and texture, as well as the temperament of the heart. Thus, the heart is necessarily forced to complete its fill by absorbing the spirit [1]."

b. Mujiz al Qanun [18]

The book mainly discussed about the mental health. Ibn al-Nafis wrote that, using the cleaning sticks moderately is very important because it helps to lessen the rate of the dental caries helps to remove the remaining of the food in and on the teeth as well the bacterium. He stated, *"If a person wants to keep his teeth healthy one should pay attention to following things. Keep oneself away from eating or drinking very fast, over drinking during the meal followed by too much movement, chewing sweet things, very cold food or drink followed by hot ones; breaking hard things with teeth such as nuts and almonds."*

He assured that chewing the sticky sweets is harmful, because it leads to dental caries. Also because the soft and sticky kinds of food are easily to be stuck on the teeth; besides sweets are considered the worst among different kind of food because they produce acids which dissolve the dental structure. This acidity increases and has bad effect on the enamel of the teeth if we eat extra food after our main meals.

c. Al-Muhadhab fi al-Kuhl al-Mujarrab (The Refined Book on Ophthalmology)

In this book, he gave new treatments for glaucoma and the weakness of vision in one eye when the other eye is affected by disease [1].

17. Ibn El-Quff

Al-Omdah fi Sinâ-at al Jirahah (Al Omdah in Surgery)

It comprises twenty treatises, in which he gave a detailed description of surgical hand work of cautery, cupping, and extraction of arrows, scarification, skin incisions, punctures, and venesection. In his surgical practice he used variable metal instruments that were invented and used by the previous physicians [4].

18. al-Antaki

Tadhkirat Uli l-al-Bab wa l-Jami li-L-'Ajab al-'Ujab

It is a medical and pharmaceutical encyclopedia, containing detailed descriptions of natural remedies use in the Bilad al-Sham. The book consists of an introduction and four parts. Part one is a general preface on medical wisdom and discusses various diagnostic methods. Part two shared a history of the development of pharmaceutical science, beginning with Dioscorides and ending with Al-Antaki's contemporaries. This part of the text also describes the nature of simple and complex drugs and gives general instructions to pharmacists. Part three enlists natural medicinal substances includes hundreds of plants, minerals, and animals (and their organs) with their indications [1].

Table 1: Natural drugs mentioned by Greco Arabic Scientists in their publications

Latin name	Indications mentioned in the book	Drug mention in the book	Author
Herbal Drugs			
<i>Acorus calamus</i> L.	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
	Urinary incontinence	<i>Al-Kitab Al-Mansuri</i>	Al-Razi ^[5]
<i>Aconitum napellus</i> L. (roots)	Leprosy	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[19]
<i>Aesculus hippocastanum</i> L.	Leucorrhoea		Al-Baitar ^[20]
<i>Albizia lebeck</i> (L.) Benth.	Toothache		
<i>Aloe vera</i> (L.) Burm. f. (leaves)	Gingivitis	<i>Al-Adwiah Al-Mufrada</i>	Ibn Abi-I-Salt al-Andalusi ^[21]
<i>Allium sativum</i> L.(bulb)	Alopecia and toothache	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
	Laxative	<i>Kitab Intikhab Al-Iqtidab</i>	Abu Nasr Sa`ed Al-Baghdadi ^[23]
	Laxative, used in alopecia, chronic cough, , sciatica and dog bite	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[23]
	Asthma		Al-Baitar ^[23]
<i>Althaea officinalis</i> L.	Used in abscess and dissolves renal stones	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
<i>Anacyclus depressus</i> Ball.	Filler in dental caries	<i>Kitab Zad Al-Musafir Wa Qut Al-Hadir</i>	Al Jazzar ^[1]
<i>Anacyclus pyrethrum</i> (L.) Lag.			
<i>Alpinia galanga</i> (L.) Willd. (rhizomes)	Used in gingival ulcers and perfuming the mouth smell	<i>Al-Adwiah Al-Mufrada</i>	Ibn Abi-I-Salt al-Andalusi ^[21]
	Urinary incontinence	<i>Al-Kitab Al-Mansuri</i>	Al-Razi ^[5]
<i>Ammi majus</i> L. (seeds)	Leucorrhoea	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[19]
<i>Ammi majus</i> L.	Gout	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[7]
<i>Amomum subulatum</i> (fruit rind)	Dissolves renal stones	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[20]
<i>Apium vulgare</i> L.	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Aristolochia gigantea</i> Mart.	Gout		Al-Razi ^[7]
<i>Aristolochia longa</i> L. or / + <i>Aristolochia rotunda</i> L. (roots)	Abscess, hepatitis,	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
<i>Artemisia absinthium</i> L.	Alopecia, piles	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
<i>Artemisia judaica</i> L.	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Asparagus officinalis</i> L.			
<i>Bambusa arundinacea</i> Willd. (roots)	Alopecia	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[20]
<i>Bamboo manna</i> *	Exhilarant and cardio-tonic	<i>Al-Adwia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Borago officinalis</i> L.			
<i>Boswellia serrata</i> Roxb. ex Colebr. (exudates)	Alopecia	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[20]
<i>Brassica nigra</i> (L.) K. Koch (leaves)	Laxative	<i>Kitab Intikhab Al-Iqtidab</i>	Abu Nasr Sa`ed Al-Baghdadi ^[23]
	Alopecia, arthritis, scabies, sciatica and vitiligo		Ibn Sina ^[23]
<i>Cannabis indica</i> Lam.	Local anesthesia	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[14]
<i>Cannabis sativa</i> L. (seeds, leaves, root)	Toothache		Ibn Sina ^[22]
<i>Cardiospermum halicacabum</i> L.	Vomiting		
<i>Carthamus tinctorius</i> L. (seeds)	Leprosy	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[20]
	Laxative and also used in leprosy		Al-Baitar ^[23]
	Laxative	<i>Kitab Intikhab Al-Iqtidab</i>	Abu Nasr Sa`ed Al-Baghdadi ^[23]
<i>Cassia fistula</i> L. (fruits)	Clears the voice	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[23]
	Hepatitis	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
<i>Cedrus atlantica</i> (Endl.) Manetti ex Carrière. (resin)	Filler in dental caries	<i>Kitab Zad Al-Musafir Wa Qut Al-Hadir</i>	Al Jazzar ^[1]
<i>Cedrus deodara</i> (Roxb. ex D.Don) G. Don	Dissolves renal stones	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
<i>Cicer arietinum</i> L.	Toothache		
<i>Cinnamomum camphora</i> (L.) J.Presl.	Exhilarant and cardio-tonic	<i>Al-Adwia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Cinnamomum cassia</i> (L.) J.Presl.	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Cinnamomum tamala</i> (Buch.-Ham.) T.Nees & Eberm.	Tonic for vital organ	<i>Al-Adwia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Cinnamomum verum</i> J. Presl.	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Citrus medica</i> L.	Cardio-tonic	<i>Al-Adwia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Citrullus colocynthis</i> (L.) Schrad. (fruit pulp)	Leprosy and toothache	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
	Alopecia, leprosy and toothache	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
	Gout	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[7]
<i>Citrus limon</i> (L.) Osbeck. (fruit)	Piles	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
<i>Crocus sativus</i> L.	Strong exhilarant and tonic	<i>Al-Adwia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Colchicum autumnale</i> L.	Gout	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[7]
<i>Conium maculatum</i> L.	Anesthesia	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[14]
<i>Coriandrum sativum</i> L.(leaves and fruits)	Oral ulcers, perfuming the mouth smell	<i>Al-Adwiah Al-Mufrada</i>	Ibn Abi-I-Salt al-Andalusi ^[21]
<i>Cuminum cyminum</i> L. (seeds)	Leucorrhoea, dissolves renal stones		Al-Baitar ^[20]
<i>Curcuma zedoaria</i> (Christm.) Roscoe. (roots)	Migraine, toothache	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
<i>Cymbopogon jwarancusa</i> (Jones) Schult. (grass)	Hepatitis		Al-Baitar ^[19]

<i>Cynara scolymus</i> L.	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Dianthus caryophyllus</i> L.(wood)			
<i>Dolichousnea longissima</i> Ach.	Hepatitis, vomiting		
<i>Dorema ammoniacum</i> D.Don (exudates)	Anorexia, leucorrhoea	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
<i>Dryopteris filix-mas</i> (L.) Schott (male fern)	Cataract	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[25]
<i>Ferula assa-foetida</i> L.	Piles	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
<i>Ferula persica</i> Willd. (latex)	Cataract	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[25]
<i>Ficus carica</i> L. (fruit)	Laxative	<i>Kitab Intikhab Al-Iqtidab</i>	Abu Nasr Sa'ed Al-Baghdadi ^[23]
	Laxative and also use in chronic cough and herpes	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[23]
<i>Galla Chinensis</i> Mill.*	Filler in dental caries	<i>Kitab Zad Al-Musafir Wa Qut Al-Hadir</i>	Al Jazzar ^[1]
<i>Helianthus annuus</i> L.	Cardio-tonic	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Hyoscyamus niger</i> L.	Anesthesia		Ibn Sina ^[14]
<i>Illicium verum</i> Hook.f.	Cataract	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
<i>Lavendula stoechas</i> L.	Exhilarant and cardio-tonic	<i>Al-Advia Wal-Qalbiya</i>	Ibn Sina ^[17]
<i>Lupinus albus</i> L.	Piles	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[19]
<i>Lycogala epidendrum</i> (Linn.) Fr.	Filler in dental caries	<i>Kitab Zad al-Musafir wa qut al-Hadir</i>	Al Jazzar ^[1]
<i>Malus domestica</i> Borkh.	Exhilarant and cardiotoxic	<i>Al-Advia Wal-Qalbiya</i>	Ibn Sina ^[17]
<i>Mandragora officinarum</i> L.	Anesthesia		Ibn Sina ^[14]
<i>Matricaria chamomilla</i> L.	Renal stones	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
	Filler in dental caries	<i>Kitab Zad Al-Musafir Wa Qut Al-Hadir</i>	Al Jazzar ^[1]
<i>Melia azedarach</i> L. (roots, fruit)			
<i>Morus macroura</i> Miq.	Toothache	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
<i>Muscus arboreus</i> *	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Myrtus communis</i> L.	Exhilarant and cardiotoxic	<i>Al-Advia Wal-Qalbiya</i>	Ibn Sina ^[17]
<i>Myristica fragrans</i> Houtt. (fruit rind)	Migraine	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[19]
<i>Nardostachys jatamansi</i> (D.Don) DC.	Tonic and exhilarant	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Nepeta orientalis</i> Mill.	Abscess	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
<i>Nepeta hindostana</i> (B.Heyne ex Roth) Haines	Exhilarant and cardio-tonic		
<i>Nymphaea alba</i> L.	Cardio-tonic	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Ocimum basilicum</i> L.	Exhilarant and cardio-tonic		
<i>Olea europaea</i> L. (leaves, fruit, kernel)	Filler in dental caries, toothache, leucorrhoea.	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
	Leucorrhoea	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
<i>Olea ferruginea</i> Wall. ex Aitch.	Exhilarant and cardio-tonic	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Origanum majorana</i> L.	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Pandanus tectorius</i> Parkinson ex Du Roi.	Cardio-tonic and brain-tonic	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Parietaria judaica</i> L.	Filler in dental caries	<i>Kitab Zad Al-Musafir Wa Qut Al-Hadir</i>	Al-Jazzar ^[1]
<i>Papaver somniferum</i> L. (seeds)	Leucorrhoea	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
	Gout	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[7]
	Local anesthesia	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[14]
<i>Phyllanthus emblica</i> L. (fruit)	Piles, vomiting		Ibn Sina ^[22]
	Exhilarant and cardiotoxic	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Pinus succinifera</i> (exudates)	Vomiting	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[20]
<i>Pistacia lentiscus</i> L.(resin)	Gingivitis and perfuming the mouth smell	<i>Al-Adwiah Al-Mufrada</i>	Ibn Abi-l-Salt al-Andalusi ^[21]
<i>Pistacia terebinthus</i> L. (resin)	Filler in dental caries	<i>Kitab Zad Al-Musafir Wa Qut Al-Hadir</i>	Al-Jazzar ^[1]
<i>Piper cubeba</i> Bojer*	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Plantago major</i> L.(leaves and seeds)	Gingival retraction and stops its bleeding	<i>Al-Adwiah Al-Mufrada</i>	Ibn Abi-l-Salt al-Andalusi ^[21]
<i>Polypodium vulgare</i> L.			
<i>Pueraria tuberosa</i> (Willd.) DC. (seeds, roots, leaves, fruit)	Leprosy	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[19]
<i>Punica granatum</i> L. (fruit)	Gastric ulcer, vomiting		Al-Baitar ^[24]
	Cardio-tonic	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Quercus incana</i> Bartram. (fruit)	Urinary incontinence	<i>Al-Kitab Al-Mansuri</i>	Al-Razi ^[5]
<i>Quercus macrocarpa</i> Michx. (fruit and roots)	Gingivitis and stomatitis	<i>Al-Adwiah Al Mufrada</i>	Ibn Abi-l-Salt al-Andalusi ^[21]
<i>Rhamnus cathartica</i> L.	Filler in dental caries	<i>Kitab Zad Al-Musafir Wa Qut Al-Hadir</i>	Al-Jazzar ^[1]
<i>Rheum officinale</i> Baill. (roots)	Anemia, migraine	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
<i>Rhus typhina</i> L.(fruits and leaves)	Gingival retraction	<i>Al-Adwiah Al Mufrada</i>	Ibn Abi-l-Salt al-Andalusi ^[21]
<i>Pistacia terebinthus</i> L. (resin)	Filler in dental caries	<i>Kitab Zad Al-Musafir Wa Qut Al-Hadir</i>	Al-Jazzar ^[1]
<i>Rosa canina</i> L. (rose petals)	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Rubus aboriginum</i> Rydb.(leaves)	Stomatitis. Perfuming the mouth	<i>Al-Adwiah Al Mufrada</i>	Ibn Abi-l-Salt al-

	smell and oral ulcers		Andalusi ^[21]
<i>Ruscus aculeatus</i> L.	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Ruta graveolens</i> L. (flower, leaves)	Alopecia	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
<i>Saussurea hypoleuca</i> Spreng. ex DC. (roots)	Alopecia, dissolves renal stones	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[20]
<i>Semecarpus anacardium</i> L.f. (fruits)	Alopecia	<i>Al Qanoon Fit Tibb</i>	Al-Baitar ^[19]
<i>Silybum marianum</i> (L.) Gaertn.			Ibn Sina ^[22]
<i>Styrax officinalis</i> L.	Laxative	<i>Kitab Intikhab Al-Iqtidab</i>	Abu Nasr Sa'ed Al-Baghdadi ^[23]
<i>Swertia chirayita</i> (Roxb.) Buch.-Ham. ex C.B. Clarke. (stem, bark, leaves, flower, fruit and root)	Hepatitis	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[20]
<i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry (flower bud)	Vomiting		
<i>Tanacetum cinerariifolium</i> (Trevir.) Sch. Bip.	Filler in dental caries	<i>Kitab Zad Al-Musafir Wa Qut Al-Hadir</i>	Al-Jazzar ^[1]
<i>Tanacetum parthenium</i> (L.) Sch.Bip. / <i>Matricaria pyrethrum</i> Baill.	Piles	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
<i>Taxodium distichum</i> (L.) Rich. (leaves)	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Taxus baccata</i> L.	Exhilarant and tonic	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Thymus serpyllum</i> L. (whole plant)	Anorexia	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
	Gout	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[7]
<i>Trigonella foenum-graecum</i> L. (seeds)	Abscess, gastric ulcer and piles	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[22]
<i>Thymus glaber</i> Mill.	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Usnea longissima</i> Asch.	cardio-tonic	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Vateria indica</i> L.			
<i>Valeriana officinalis</i> L.	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
<i>Valeriana wallichii</i> DC.			
<i>Vitex agnus-castus</i> L. (leaves, roots)	Abscess	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[20]
<i>Vitis vinifera</i> L. (fruit)	Hepatitis, leucorrhoea		Al-Baitar ^[19]
Animal based drugs			
<i>Bombyx mori</i>	Brain tonic and cardio-tonic	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Bos Taurus</i> L. (Cow cheese)	Dysuria and scabies	<i>Tadhkirat Uli l-al-Bab-wa l-Jami li-L-'Ajab Al-'Ujab</i>	Al-Antaki ^[1]
<i>Camelus dromedaries</i> L. (Rennet of Arabian Camel)	Exhilarant	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
<i>Corallium rubrum</i> L.	Exhilarant and cardio-tonic		
Echinoidea (Petrified spines of sea urchin)	Dissolves kidney and bladder stones.	<i>Tadhkirat Uli l-al-Bab-wa l-Jami li-L-'Ajab Al-'Ujab</i>	Al-Antaki ^[1]
<i>Otis tarda</i> L. (Bustard's stomach and ashes from its feathers and claws)	Cataracts, pneumonia, dissolve kidney stones.		
Lampyridae (Firefly bug)	Used in hemorrhoids and dissolves kidney stones		
<i>Merops philippinus</i> L. (Bee eater bird)	Skin diseases		
<i>Moschus moschiferus</i> L. (Siberian Musk Deer)	Exhilarant and cardio-tonic	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
Mineral drugs			
Alum	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
Borax (sodium borate)	Laxative	<i>Kitab Intikhab Al-Iqtidab</i>	Abu Nasr Sa'ed Al-Baghdadi ^[23]
	Good for nerve twist,	<i>Al Qanoon Fit Tibb</i>	Ibn Sina ^[23]
	Deafness	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[23]
Hajrul Yahud (Jew's stone)	To dissolves kidney and bladder stones.	<i>Tadhkirat Uli l-al-Bab-wa l-Jami li-L-'Ajab Al-'Ujab</i>	Al-Antaki ^[1]
<i>Lapis lazuli</i> (blue gemstone)	Exhilarant and cardio-tonic	<i>Al-Advia Wal Qalbiya</i>	Ibn Sina ^[17]
Mineral hematite	Diarrhea and skin diseases	<i>Tadhkirat Uli l-al-Bab-wa l-Jami li-L-'Ajab Al-'Ujab</i>	Al-Antaki ^[1]
Orpiment (a bright yellow mineral consisting of arsenic trisulphide)	Alopecia	<i>Al Advia Wal Aghdia</i>	Al-Baitar ^[24]
Sidon earth	Knitting together fractured bones after local application	<i>Tadhkirat Uli l-al-Bab-wa l-Jami li-L-'Ajab Al-'Ujab</i>	Al-Antaki ^[1]
<i>Venetian ceruse</i> / (white lead)	Antiperspirant and deodorant	<i>Al-Hawi Fi-Tibb</i>	Al-Razi ^[9]
Zinc			

Key: All drugs indicated to take orally except when indicated as an antiperspirant, anesthetic, deodorant and filler in dental caries (locally application). *= plants not found in the electronic database The Plant List - a working list of all plant species created by Royal Botanical Gardens, Kew and Missouri Botanical Garden.

References

1. Saad B, Said O. Greco-arab and Islamic herbal medicine - Traditional system, ethics, safety, efficacy, and regulatory issues, Hoboken, New Jersey.: John Wiley & Sons, Inc. 2011.
2. Akanni S. An exposition of Islamic medication in the light of the Quran and Hadith. Proceedings on 1st Annual International Interdisciplinary Conference, Azores, Portugal, 2013, 176-182.
3. Kaadan A, Atat A. Physician's commandments at Abu Nasr Sa'ed Al-Baghdadi (Died 624 H). Journal of the International Society for the History of Islamic Medicine. 2013-2014; 12-13(23-26):155-158.

4. Shehata M. Medical instruments in Islamic medicine *Journal of the International Society for the History of Islamic Medicine*, 2007-2008; 6-7:60-66.
5. Sultana A, Rahman K, Padmaja A. Urinary incontinence (Salasal bawl) in Greco-Arabic medicine: a review. *Acta Medico-Historica Adriatica*, 2015; 13(suppl-2):57-76.
6. David Osborn M. Al-Razi, or Rhazes-Medieval Persian Physician and Alchemis. *Greek Medicine.net* http://www.greekmedicine.net/whos_who/Al-Razi-Rhazes.html, 2015.
7. Tibi S. Al-Razi Islamic medicine in the 9th Century. *JLL Bulletin: Commentaries on the history of treatment evaluation* <http://www.jameslindlibrary.org/articles/al-razi-and-islamic-medicine-in-the-9th-century/>, 2005.
8. Khan AA, Zulkifle M, Ansari AH, Abdul Hai KN. Persian contribution to Greco-Arab medicine: A review. *Journal of the International Society for the History of Islamic Medicine*. 2007-2008; 6-7:107-111.
9. Mawaldi M, Kataya M. History of odor removers and anti-perspirant in the Arabic medical heritage. *Journal of the International Society for the History of Islamic Medicine*. 2009-2010; 8-9(15-18):26-30.
10. Ammar S. Ibn Al Jazzar and the Kairouan medical school of the tenth century AD. *Vesalius*, 1998. IV: 3-4.
11. Kaadan A, Angrini M. Who discovered Hemophilia? *Journal of the International Society for the history of Islamic medicine*. 2009-2010; 8-9(15-18):46-50.
12. Haloubi A, Kassab A. The achievements of Albucasis in the field of oral surgery. *Journal of the International Society for the History of Islamic Medicine*. 2007-2008; 6-7:12-15.
13. Akmal M, Zulkifle M, Ansari AH. Ibn Nafis – a forgotten genius in the discovery of pulmonary blood circulation. *Heart Views: The Official Journal of the Gulf Heart Association*. 2010; 11(1):26-30.
14. Taha J. Unknown contributions of the Arab and Islamic medicine in the field of anaesthesia in the West. *Journal of the International Society for the History of Islamic Medicine*. 2007-2008; 6-7:67-71.
15. Khan M, Latafat T, Khan A. Ibn-e-Sena and breast feeding in today's prospective. *Journal of the International Society for the History of Islamic Medicine*. 2013-2014; 12-13(23-26):90-94.
16. Khan AA, Ashraf SMS, Zulkifle M, Abdul Hai KN. Historical perspective of Wajaulmafasil (Osteoarthritis) and with special reference to contribution of Greco-Arab physicians. *Journal of the International Society for the History of Islamic Medicine*. 2013-2014; 12-13(23-26):172-174.
17. Ahmed W, Khan K. Cardiology with Special Reference to Al-Qanoon Fil Tibb and Al-Advia Wal-Qalbiya. *Journal of the International Society for the History of Islamic Medicine*. 2007-2008; 6-7:2-6.
18. Mawaldi M, Kaadan A, Jabban H. Maintenance of dental health in manuscript "Mujiz Al-Qanun" by Ibn Al-NAFIS. *Journal of the International Society for the History of Islamic Medicine*. 2007-2008; 6-7:35-38.
19. Al-Baitar Z. *Al-Jaame'-li-Mufradaat-al-Advia-wal-Aghzia*. Vol. I. 1874, Cairo, Misr (Egypt): Matba Amra.
20. Al-Baitar Z. *Al-Jaame'-li-Mufradaat-al-Advia-wal-Aghzia*. Vol. IV. 1874, Cairo, Misr (Egypt): Matba Amra.
21. Kaadan A, Jalkhi B, Khashan A. Treatment of oral ulcers In *Al-Adwiah al-Mufrada Manuscript by Ibn Abi-l-Salt al-Andalusi*. *Journal of the International Society for the History of Islamic Medicine*. 2013-2014; 12-13(23-26):129-132.
22. Ibn-e-Sina A. *Al-Qaanoon-fil-Tibb*, vol. II (11th century AD). 1987, New Delhi-62, 1408H: Institute of History of Medicine and Medical Research, Jamia Hamdard.
23. Jalkhi B, Yaseen Atat A. Laxative medicine as viewed by Abu Nasr Sa'ed Al-Baghdadi. *Journal of the International Society for the History of Islamic Medicine*. 2013-2014; 12-13(23-26):68-71.
24. Al-Baitar Z. *Al-Jaame'-li-Mufradaat-al-Advia-wal-Aghzia*. Vol. II. 1874, Cairo, Misr (Egypt): Matba Amra.
25. Al-Baitar Z. *Al-Jaame'-li-Mufradaat-al-Advia-wal-Aghzia*. Vol. III. 1874, Cairo, Misr (Egypt): Matba Amra.