

The Contribution of Al-Razi to the Evolution of Modern Science



Abdussalam Ismail Onagun
Islamic Financial Services Board (IFSB)

Abdussalam Mikail
Universiti Sains Islam Malaysia

Abstract

Islam is a religion that has been marked by human civilization. The reality shows the researcher and scientist, that Islamic civilization derived all its components, and elements of its existence, and the reasons for development and prosperity of Islam. This fact coupled with a suitable and favorable culture of seeking knowledge, resulted in the flourish and growth in all disciplines of science. In addition to that, many Caliphs strived to create a conducive environment for scholars and scientists to work, and rewarded innovative scholars generously. This paper will examine the evolution of Al-Razi to the modern science being the first physician in human history who described in details the symptoms and signs of smallpox and measles based on clinical examination, and he was the first who distinguished between these two diseases by putting what is called now the differential diagnosis. This paper will focus on Al-Razi's Book on Smallpox and Measles (Kitab al-Jadari wa 'l-Hasba), the Scientific Value of the Book, how the smallpox and measles diseases were dealt with by al-Razi in several of his medical works, as shown in Al-Hawi fi 'l-Tibb, A treatise on pediatric diseases (Risala fi amradh al-atfal wa 'l-'ianaya bhihim), and the effect of al-Razi concepts related to smallpox and measles on the physicians after him. Finally, this paper will show the great impact of Muslim scholars in evolution of Modern science.

Keywords: al-Rai, al-Tibb, smallpox

Introduction

Sicily is an island where the established Muslim civilization lasted for quite a long time, before the fall of this island into the hands of the Normans, to turn into the biggest blessing

of civilization known in the West in those times. As the Norman kings were willing to be indulged and assimilated into the Islamic civilization. Muslims played a leading role in the industries and crafts, architecture and decorations in Sicily at that time. Palaces of the Norman kings and their furniture and accessories were all the work of Muslims. These kings did not work to translate science into Arabic, but were keen to attract some Arab scholars and generosity and hospitality and ask them to classify scientific literature.

Such a wise policy shifted to the point of Sicily, a strong cultural activity where they mixed the Arab-Islamic civilization with European cultures to contribute to the creation of its modern renaissance. As for Spain, where the Arab Islamic civilization has taken root and achieved great achievements of civilization and reflected superior economic prosperity. And Christians of Spain at first tried to distance themselves from the Muslims after they entered Andalusia, but that did not last more than a few years after which Christian intolerance against Muslims diminished. Again similar to the case of Sicily, Andalusia under Islamic rule emerged as a centre of knowledge and as the pinnacle of civilization at the time. Technological advances contributed by the Muslim scholars and scientist of Andalusia made the exploration and the discovery of the new world possible (Ruthven, and Nanji Azim, 2007).

Sheikh Al-Razi being one of the Muslim scientific of those eras mentioned, this paper will examine the evolution of Al-Razi to the modern science being the first physician in human history who described in details the symptoms and signs of smallpox and measles based on clinical examination, and he was the first who distinguished between these two diseases by putting what is called now the differential diagnosis. This paper will focus on Al-Razi's Book on Smallpox and Measles (*Kitab al-Jadari wa 'l-Hasba*), the Scientific Value of the Book, how the smallpox and measles diseases were dealt with by al-Razi in several of his medical works, as shown in Al-Hawi fi 'l-Tibb, A treatise on pediatric diseases (*Risalah fi amradh al-atfal wa 'l-'ianaya bihim*), and the effect of al-Razi concepts related to smallpox and measles on the physicians after him. Finally, this paper will show the great impact of Muslim scholars in the evolution of Modern science.

Short Biography of Al-Razi

Abu Bakr Muhammad Ibn Zakariya al-Razi was born in al-Ray City near Tehran in 251 H / 865 CE and died there in 313 H / 925 CE. He was a well known Muslim physician and writer, whose medical writings greatly influenced the Islamic world as well as Western Europe in the Middle Ages. He wrote on almost every aspect of medicine. Al-Razi moved to Baghdad when he was forty years old, and headed many hospitals. Europe knew him under the Latinized form of his name, Rhazes (Ruthven, and Nanji Azim, 2007).

Al-Razi composed more than two hundred books related to medicine, pharmacy, philosophy, music and many other sciences. And he is considered the first who founded experimental science especially in the field of medicine and chemistry, given his major interest in the experimental methodology in different natural sciences (W. Hazmy, Zainurashid Z, and Hussaini R, 2006).

Al-Razi's Book on Smallpox and Measles (*Kitab al-Jadari wa 'l-Hasba*)

Al-Razi was the first physician in history who described in details the symptoms and signs of smallpox and measles based on clinical examination, and he was the first who distinguished between these two diseases by putting what is called now the differential diagnosis. This was very clear in his *Book on Smallpox and Measles*. A manuscript of this book is kept now in Leiden University Library in the Netherlands under the number 761 (W. Hazmy C.H, Zainurashid Z, and Hussaini R, 2006).

A microfilm of this manuscript exists in the Library of the Institute for the History of Arabic Science in Aleppo. This book was edited in Arabic and gained a great popularity in Europe after it was translated several times into Latin and other European languages, including French, English and German. According to Honka, the book was published in Europe forty times between 1498 and 1866. But the interest that surrounds this book was during the 18th century, at a time when there was much interest in the inoculation or varulation around 1720 following the description of the procedure in Turkey by Lady Mary Wortley Montagu, the wife of the Ambassador Extraordinary to the Turkish court in Istanbul. Al-Razi began his book with a short introduction, in which he explained the direct cause for composing his treatise, as he did not find a satisfying book written by the physicians before him dealing with this subject.

The book consists of fourteen chapters. The first defines the causes of the two diseases and why just few people could escape from the attack. In the second chapter al-Razi mentioned the bodies which are more susceptible to get smallpox, and the times in the year in which the disease is more common. In this regard he says that thin, hot and dry bodies are more susceptible for measles and not to smallpox, while thin, cold and dry bodies are not susceptible for both diseases, but if they are attacked by smallpox, the disease will be benign. The times in which smallpox is most probable to widespread are at the end of autumn and the beginning of spring. In severely hot and dry summers and also if the autumn was hot and dry without rain, measles would be more expected in susceptible individuals.

The third chapter is the most important of the whole book. It is entitled: the chapter related to the symptoms suggesting the exacerbation of smallpox and measles'. In this chapter al-Razi declares that before a smallpox eruption, the patient complains of continuous fever,

back pain, nose itching and sleeping disorders. Then he mentions many other general symptoms and signs such as generalized pain, breathing difficulties, cough, redness in the cheeks and eyes, sore throat, dry mouth, hoarseness, headache, anxiety and sometimes syncope may be developed.

Upon reviewing this text we can recognize that al-Razi clearly emphasized that smallpox is different from measles, and he declared that there are common signs for the two diseases, and other more specific signs for every disease, enabling the physician to make a differential diagnosis between them.

The most probable common signs between smallpox and measles are: Continuous fever, nose itching, allergy in the body, cheek and eyes redness, sore throat, chest pain, breathing difficulties, cough, hoarseness, headache and sometimes syncope. The author says that it is not necessary that all of these symptoms and signs should appear together, as some of them may be absent. On the other hand, regarding the symptoms, which are specific for every disease, he says that back pain is more severe in smallpox, while it may be slight or absent in measles. Distress, syncope and anxiety are more prominent in measles.

The fourth chapter is on the management of smallpox in general, so he indicates ten procedures which should be carried out to achieve this purpose. The fifth chapter, which is the longest chapter of the book, deals with the prevention of smallpox before the appearance of its signs, and diminishing its diffusion after the signs appear. In this chapter al-Razi advises to perform venesection to all patients above fourteen years old and cupping for young patients. Then his advice is to use special diets according to the patient's condition and age.

The sixth chapter is on the factors which accelerate the appearance of skin lesions in smallpox. Al-Razi says that a massage and drinking cold water could accelerate the appearance of smallpox and measles especially when the fever is severe, thus the disease will pass easily. Also he mentioned the use of many herbal drugs which may play an important role to achieve this purpose.

The seventh chapter is on taking care of the eye, throat and other organs, which need to be cared for after the appearance of smallpox signs. In this chapter al-Razi explains how this care should be performed. He also draws attention for taking care of the feet and hands, as severe pain may develop resulting from sclerosis of the skin in these members.

The eighth chapter is on the factors which accelerate the maturation of smallpox. Here al-Razi advises in the case where the patient is in a good condition, the physician should do his best to mature smallpox. In this case, bandages of hot water with some flowers boiled inside it are applied to the sites of the lesion.

The ninth chapter is on the factors which dry or desiccate smallpox. In the case where smallpox is wet, some kinds of ointments taken from many kinds of plants like rice are applied to dry it and make it possible to be removed.

The tenth chapter is on the substances which remove the crust. Al-Razi says that if the lesion became dry and a residual of crust is still dominant, the physician should look if it was thin and dry the ointment of acetic acid should be applied first several times until it completely disappears. When the lesion is located in the face, a special kind of ointment derived from peanuts should be used. If the crust is wet, the physician may carefully scrape it off without using any ointment.

The eleventh chapter is on the substances, which remove the residual effect of smallpox on the eye and all the body. Here al-Razi differentiates between the residual effects of smallpox on the eye from that on the rest of the body. In the first case he indicates to use many kinds of ointments, some of them derived from animal products. If the lesions are located all over the body, many compound ointments may be used.

The twelfth chapter is on the diet recommended to a smallpox patient. The patient should drink malt (barley with water) exactly as done in acute diseases. Also, peeled lentils mixed with some other juices like acetic acid, may be of beneficial effect for smallpox patients.

The thirteenth chapter is on the management of bowel function. Al-Razi states that in the last stages of most cases of measles and smallpox the faeces is soft especially in measles, therefore laxatives should be avoided except in the early stages of some cases of smallpox especially when there is fever or headache.

The fourteenth chapter is on the prognosis of smallpox and measles. In this last chapter al-Razi describes the signs where the prognosis is bad, and where the prognosis is good. He considered severe pain, continuous fever, insomnia, nose itching and a shining color of the eruption as signs of bad prognosis.

The Scientific Value of the Book

1. Al-Razi's *Book on Smallpox and Measles* is considered the first one of its kind, as it gives an explanation for smallpox and measles in an isolated book.
2. In the first chapter he mentioned that the putrefying air is a contributive factor for spreading the disease.
3. In this respect, al-Razi is credited as the scholar who differentiated, for the first time in the history of medicine, between these two diseases, and described every disease separately in details, unlike all Greek and Arab physicians before him, who considered the two diseases as one disease. Many historians such as Justave

Lebon, Sigrid Honka, Douglas and others recognized this priority. In this book, al-Razi differentiated between the two diseases in three places: in the second chapter, when he talked about the bodies which are more susceptible to get smallpox, and the times in the year, in which the disease is more common. Also, in the third chapter he pointed out the symptoms that suggest the eruption of smallpox and measles. In the fourteenth chapter, which is on the prognosis of smallpox and measles, he also differentiated between these two diseases.

4. He recognized the relationship between the type of the eruption in measles and the severity of the disease.
5. The opinions of al-Razi are characterized by being free of false old concepts, so it was clear that al-Razi was very keen to prescribe the treatment in detail and the kinds of food which are more suitable, as he believed that food has an important role in the treatment.
6. Al-Razi disagrees with other physicians before him in using cold water to neutralize severe fever in smallpox and measles diseases.
7. The *Kitab al-judari wa 'l-hasba* provides a decisive proof that al-Razi, such as many other Muslim physicians, was not just a translator of Greek, Indian and Syriac medicine. Indeed, in addition to the very important achievement exposed in the treatise, he innovated a lot of theories and new opinions, which contributed in medicine development at that time.

Harrison's textbook of internal medicine mentioned that al-Razi was the first who described the measles disease and differentiated it from smallpox. Also, in the popular *Encarta Encyclopedia* (1998 edition), it is written: "Al-Razi's personal experiences and observations as a physician make *al-Hawi* a landmark in the history of medicine. In his most famous work, *Treatise on Smallpox and Measles*, al-Razi gives the earliest known description of smallpox".

The smallpox and measles diseases were dealt with by al-Razi in several of his other medical works, as shown in the following paragraphs.

Al-Hawi fi 'l-Tibb:

Al-Hawi fi 'l-Tibb is an extremely important source for knowledge of Greek, Indian and early Arabic writings, for al-Razi was meticulous about crediting his sources. Al-Razi died before arranging fully the book, but his followers rearranged it under the supervision of Ibn al-'Amid who was the minister of al-Hassan ibn Bouyeih. This comprehensive book on medicine, *al-Hawi*, was translated into Latin in 1279 under the title of *Liber Continens* by Faraj ben Salem, a physician of Sicilian Jewish origin, employed by Charles of Anjou to translate medical works. Later it was translated many times into Latin, and became one of the nine books relied on in teaching in the medical college library of Paris in 1395. A

special part of this book, which is related to pharmacology, was still considered the first reference in Europe for a long time after the renaissance age. There is a rare manuscript of the translation of *al-Hawi* into Latin, written in 1282, in the French National Library in Paris. The first edition was published in Italy in 1486 under the title: *Liber Dictus Elhavi*, then many editions appeared, the last one was under the title: *Continens Rasis* in 1542. There exists a rare copy of this edition in the Cambridge Library, UK.

Al-Hawi is still considered the largest medical textbook edited from the Arabic language up to date, as it consists of twenty three volumes, according to the edition which was accomplished by the Othmania Publishing House in Haydarabad, India between 1955 and 1971.

In the 17th volume of the book, al-Razi discussed smallpox and measles. He described the eruption of measles as a red skin maculae without protrusion into or out of the skin, while the eruption in smallpox is infiltrated into skin. Then, he mentions that the smallpox eruption appears as groups, while the measles eruption appears altogether. He considered the black and violet colors of the eruption in smallpox as bad prognosis.

A Treatise On Pediatric Diseases

(Risalah Fi Amradh Al-Atfal Wa 'L-'Iyanayat Bihim):

Al-Razi wrote this treatise in 900 H. Most historians like Rabdill, Gustave Lebon, and Sigrid Honka consider it as the first separated book written in pediatric diseases, because al-Razi for the first time in the history of medicine separated between pediatrics and gynecology, while all other physicians before him used to gather the two subjects in one book.

Unfortunately, the original Arabic version of this book seems to be lost. In the past it was translated into Hebrew then into Latin between 1114 and 1187, and it was published many times. Lately, Pieper translated many chapters into German, and Ruhra accomplished another translation into English, then the entire treatise was translated into Italian. Recently, Dr. Samuel Rabdill put a new English translation of this treatise and published it in the *American Pediatric Journal* (No 5, vol. 122, 1971). This translation is considered now the best version. Dr. Mahmood Haj Kasem from Iraq translated it into Arabic.

The treatise contains twenty-four chapters discussing many pediatric diseases and their treatment. Among these diseases smallpox and measles were discussed. Also, many other pediatric diseases were described such as tinea, scabies, hydrocephalous, abdominal enlargement, sneezing, insomnia, epilepsy, ear discharges, eye diseases, teeth diseases, mouth ulceration, vomiting, diarrhea, cough, worms, umbilical protrusion, hernia, urethral stone, and poliomyelitis.

In addition to the historical importance of this treatise it has a scientific importance, as it contains new opinions and theories related to pediatric diseases.

The Effect Of Al-Razi Concepts Related To Smallpox And Measles On The Physicians After Him

It is well known that during the time of al-Razi, books were not written and widely published like in our time, but there were only some manuscripts available for some scholars for every book. Therefore, we can expect that many Muslim physicians after al-Razi's time did not mention the master's concepts regarding smallpox and measles. I would like here to trace the effect of al-Razi concepts in this issue on the Muslim physicians after him.

Ali 'Ibn Abbas Al-Majusi:

He died in 994 (about 70 years after al-Razi). In the fourteenth chapter of the first volume of his book *Kamel al-Sina'a al-Tibiya*, he talked about smallpox. He considered smallpox and measles as one disease. This means that al-Majusi had no idea about al-Razi writings in this regard, or his pride prevented him to quote from al-Razi's book (Ali al-Majusi, 1918).

Ibn Sina:

He lived about one hundred years after al-Razi. Upon comparison between what was written by Ibn Sina in his book *al-Qanun fi 'l-ttib* (The Canon of Medicine) with al-Razi's writings on smallpox and measles, it is clear that Ibn Sina quoted a lot of information from al-Razi. In the third book of *al-Qanun*, he devoted a special part to deal with smallpox and measles (Nasser M, Tibi A, and Savage-Smith E, 2007). Ibn Sina differentiated between the two diseases and said they have common signs, and other signs specific for every disease. Then he described the skin eruption of every disease, resembling that written by al-Razi. But Ibn Sina did not mention that he had quoted from al-Razi's writings.

Ibn Zuhr:

He lived in al-Andalus and died there in 1162. His book is entitled *Al-Taysir fi 'l-Mudawati wa-'l-Tadbir*. It was translated into Hebrew then into Latin, and published many times under the name of *Facilicito Adjumentum*. In the second volume of the book, ibn-Zuhr devoted a chapter to smallpox and measles, and he considered them as one disease. It is clear that Ibn Zuhr did not quote from Ibn Sina's or al-Razi's writings regarding smallpox and measles, especially if we know that *al-Qanun* was well known in al-Andalus during that time (Nasser M, Tibi A, and Savage-Smith E, 2007).

Ibn al-Nafis:

He was born in Damascus and died in Cairo in 1288. His book is entitled *al-Mujaz fi al-tib* (The Concise Book in Medicine). It is considered as a revision of Ibn Sina's *Canon*. Therefore, ibn al-Nafis repeated briefly what Ibn Sina had exposed about smallpox and measles, and he differentiated between the two diseases. But, it is worth mentioning that ibn al-Nafis did not mention the back pain as a differential sign of smallpox.

Dawud al-Antaki:

He was born in Antakia and died in Mecca in 1599. His medical book, known as *Tadhkirat Dawud* (Memoir of *Dawud*), has a longer title: *Tadhkirat Uli al-albab wa 'l-Jami' li-l-'ajab al-'ujab*. In the first part of this book he describes the signs of measles and smallpox in a way very like that described by al-Razi. In addition, he differentiated between the two diseases. In the same chapter he talked about chicken pox, and considered it as a benign form of smallpox. See Nasser M, Tibi A, and Savage-Smith E, (2007).

Madian al-Qawsuni:

He was an Egyptian physician who lived in the 17th century. His medical book is entitled *Qamus al-atiba wa namus al-aliba* (The Physician's Dictionary). In the first chapter of the book, where he dealt with measles, he described the signs of measles and smallpox, mentioning that he quoted it from Ibn Sina's *Canon*. He differentiated between the two diseases saying that the lesion in measles is small, thin and does not extend outside the skin, while smallpox lesion is protruded outside the skin and thick. (Abdurrahman, 1969).

Conclusion

European Doctor De Poure, declared that : "Medicine was absent till Hypocrites created it, dead till Galen revived it, dispersed till Rhazes collected it, deficient till Avicenna completed it". No doubt that al-Razi was the first physician in the history of medicine who differentiated between smallpox and measles, and considered them as two diseases. The influence of his concepts in the diagnosis of these diseases on the Muslim physicians was very clear, especially on Ibn Sina, ibn al-Nafis, al-Antaki and al-Qawsuni. But it is worth mentioning that the majority of these physicians have quoted their information in this regard from *The Canon* of Ibn Sina, as it was the book that knew the widest diffusion and exerted the largest influence in the east as well as in the west.

The Muslim scholars and scientists discussed in this paper represent the first category of scholars who were the inventive and innovative minds that shaped their world and ours. Their contribution in the different disciplines of science was a great propagator of Islam as it became known as religion of knowledge. Their contributions were the main drive for the European renaissance and were the basis of many of the technological advances we see and experience today.

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