

To The Question about the Sources of the "Canon of Medicine" By Abu Ali Ibn Sina

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Abstract: The great polymath of the Middle Ages Abu Ali Hussein ibn Abdallah ibn Sina (980-1037) (Avicenna) in the history of mankind is better known as a brilliant physician. His vast knowledge, advanced ideas and practical innovations are reflected in his famous medical encyclopedia "The Canon of Medicine" (*Kitab al-qanun fi-t-tibb*), used in medical practice and education as the most complete and fundamental work in both Muslim East as well as in Europe.

The article attempts to determine the circle and number of authors, and written sources used by Avicenna, identify them, and also show his attitude towards them through their citation in all five books.

Keywords: Ibn Sina, Avicenna, "Canon of Medicine", ancient medical literature, Galen, Hippocrates, Dioscorides, Jundishapur medical school, Syrian physicians-translators, Hunayn ibn Ishaq al-Ibadi, medieval arabic-speaking physicians.

1. INTRODUCTION

The "Canon" is divided into five books, each of which covers a specific area of medicine with an internal classification of the material. The first book is devoted to theoretical issues of medicine, such as anatomy, health care, the theory of the four juices (*hilt*) and nature (*miza*). The second book contains information about the properties of 810 medicinal products of plant, mineral and animal origin, arranged in the order of letters according to *Abjad*. The medicinal properties of each drug are presented in a differentiated form according to their action on certain organs. Book Three deals with the diagnosis and treatment of diseases of all organs "from head to toe" according to the tradition of medieval medicine. The fourth book covers diseases common to the whole organism, questions of cosmetics, surgery, as well as information about the types and effects of poisons. Book Five is a detailed pharmacopeia containing methods for the preparation and use of compounds, i.e. multi-component drugs.

The "Canon" was completed in 1024. To write it, the author used extensive medical literature created by ancient Greek, Roman, Syrian, Byzantine, Arabic-speaking scientists over a period of more than a thousand years, but in the work by Ibn Sina he mentions only the names of the authors and very rarely indicates the name of the source.

A medieval polymath Abu Ali Hussein ibn Abd Allah ibn Sina, known in Europe as Avicenna (980-1037), wrote more than 50 scientific works on medicine, the main of which is the "Canon of Medicine" (*al-Qanun fi al-tibb*). In terms of material coverage, content and volume, this work can be called a medical encyclopedia, which systematizes all knowledge on the theory and practice of medieval medicine.

The "Canon" was written in Arabic between 1012-1024, i.e. the author worked on it for 12 years. Of course, a fundamental volume of such volume and significance required the author to study and comprehend the previous huge written material and accumulate practical experience.

In this fundamental work, Ibn Sina systematized all the medical knowledge available by that time, dividing them into five large topics (Volumes): theory, simple drugs (Materia Medica), private pathology, general pathology, complex drugs (Pharmacopoeia). In all five Volumes there are names of previous ancient and Arabic-speaking scholars with different frequency of repetition, i.e. the names of, for example, Hippocrates, Archigen, Rufus and Galen are mentioned in all five volumes, and some physicians - only on one topic.

In this article, we tried to determine the circle and number of authors of written sources used by Avicenna, identify them, and also show his attitude towards them through their citation in all five volumes.

2. MATERIAL AND METHODS

As mentioned above, the "Canon" consists of five volumes, the first of which is devoted to theoretical issues: anatomy, health care, the theory of the four juices (*hilt*) and nature (*miza*), the causes and symptoms of diseases[1]. In this volume, Ibn Sina specifically names only seven names (Hippocrates, Aristotle, Karitun, Rufus, Archigen, Galen, and Chiron), and in other cases is limited to the expressions "some people", "ancient sages", "they say", "philosophers", "physicians", "experienced Indian healers". Of the scientists mentioned, Chiron is the hero of ancient Greek mythology, a centaur with comprehensive knowledge, including medical. He taught the art of healing Asclepius (Aesculapius), the god of medicine in ancient Greek and Roman mythologies. In the "Canon" Chiron appears as a healer of one of the types of ulcers, later called the "ulcer of Chiron" [1: 150].

It should be noted that the names of Hippocrates (c. 460-355 BC) - the great ancient Greek physician, considered the "father of medicine", the famous ancient Roman physicians of Rufus and Archigen (died in 117 CE), the famous Claudius Galen, the most revered by Arabic-speaking authors of the ancient Roman physician, the largest naturalist, are found in all five Volumes of the Canon, but at the same time, Ibn Sina rarely gives the names of the works he used, for example, in Volume One in one place, concerning bloodletting, agreeing with the author, he calls his source - "The Volume of Epidemics" by Hippocrates (Arabized form Buqrat) [1: 392].

In addition to this work, Ibn Sina could also use other works by Hippocrates, the most popular of which were the Aphorisms of Hippocrates (*Fusul al-Buqrat*), translated into Syriac and Arabic by the famous translator and physician Hunayn ibn Ishaq (808-873) [7: 62]. In total, the name of Hippocrates in Volume One is mentioned 7 times in the sections of anatomy (bone structure) [1: 48, 65], health preservation (the benefits of physical exercise and clean air) [1: 314, 363], and methods of cleansing the body (bloodletting and vomiting) [392, 393, 408]. The greatest appeal to Hippocrates is found in the Volume Three (40 times), where questions of private pathology are dealt with, i.e. description and treatment of diseases that occur in all organs of the body and in Volume Four (38 times), devoted to diseases common to the whole organism, i.e. various kinds of fevers, bone injuries, ulcers and tumors, cosmetic issues. In Volume Two, which deals with the properties of 810 simple drugs of mineral, plant and animal origin, as well as in Volume Five, which is a complete medieval pharmacopoeia, the name of Hippocrates is mentioned only three times [2: 115, 124, 253; 6:74, 169, 173]. In total, in the "Canon" the author refers to Hippocrates 91 times.

Judging by the citation, the main ancient source of Ibn Sina was the works by Galen (Arab. Jalinus). In the "Canon" the titles of the works are not indicated, in rare cases one can find the expression "in one of his volumes Galen ...", but the author's respectful attitude towards Galen is noticeable from the epithets with which the quotations are included in the text: "worthy sage", "worthy of physicians", "worthy man", etc.

Galen wrote about 400 works, of which 117 have survived. At one time, Hunayn ibn Ishaq compiled a list of Galen's works translated into Syriac and Arabic, including 129 titles, of which 100 were translated by Hunayn himself. About 50 works of Galen were translated into Syriac by the predecessors of Hunayn ibn Ishaq in the 6th century [7: 71].

The popularity and scientific value of Galen's writings is explained by the fact that he was the best medical theorist after Hippocrates and systematized the achievements of previous ancient authors [7: 70].

Among Arabic-speaking authors, Galen's volume on pharmacology "The Volume of Simple Medicines" (*Kitab al-adwiya al-mufrada*), devoted to the properties of single-component drugs, was very popular. This work has been repeatedly translated into Syriac and Arabic. It was used by famous medieval scholars, including Abu Bakr al-Razi (865-925) and Abu Rayhan al-Biruni (973-1048) [7: 71, 94].

In the "Canon" references to Galen occur 259 times, of which in volume I - 35 times, volume II - 77 times, volume III - 70 times, volume IV - 49 and in volume V - 28 times. Judging by the citation, it can be assumed that Ibn Sina involved more than one work of Galen in his work on the Canon, but covered his treatises on the theory of medicine, medical volumes and pharmacological literature. As for Rufus and Archigen, the following can be said about them. Rufus of Ephesus (c. 70 - c. 110), Roman physician and anatomist, Greek by origin, originally from Ephesus. The largest physician of the Roman Empire after Galen. He studied medicine in Alexandria. Practiced in Rome. A supporter of humoral pathology, that is, a follower of Hippocrates. Author of several treatises on nutrition, pathology, anatomy and

nursing. Among them are such books as: "On the Name of the Parts of the Human Body" - the earliest surviving ancient work on anatomy; "Questions of the physician to the patient" (about the anamnesis); "On diseases of the kidneys and bladder", as well as comments on a number of treatises of the "Hippocratic collection" [12: 281, 282]. Rufus's writings enjoyed prestige in the East, and some of his works have survived only in Arabic. Many of his works were translated into Arabic by Hunayn ibn Ishaq [10: 419-420].

Throughout the text of the "Canon" the name Rufus is mentioned 25 times.

Archigen is a Greek physician who lived in the second half of the 1st - first half of the 2nd century. Born in the locality of Apamea in Syria, he worked in Rome during the reign of Trajan (83-117), where he enjoyed a very high reputation for his professional skills. Of the writings of Archigen, only fragments have survived. There is evidence that Galen wrote a Commentary to his treatise on the pulse [12: 280].

Compared to other ancient authors, Archigen was less popular among Muslim authors. But nevertheless, in the text of the "Canon" he is mentioned 15 times.

Of the ancient scientists, in addition to the above, Ibn Sina often refers to the ancient Greek physician Dioscorides (1 century) and the Alexandrian physician Paul of Aegina (615-690). Dioscorides Pedanius (Arabic: Diascuridus) was a botanist, pharmacologist, and military physician often quoted in medieval Muslim herbals and medical writings containing a section on simple remedies. His volume in Greek "On Medicines" (lat. *Materia Medica*) for more than fifteen centuries remained in the hands of druggists and physicians as one of the authoritative sources [8]. It consists of five parts, where 750 simple medicines of mineral, plant and animal origin are described [7: 65].

This volume was first translated from Greek into Arabic in the 9th century in Baghdad by Istifan ibn Basil (Stefan of Basil) and a little later this translation was edited by Hunayn ibn Ishaq.

However, Istifan's translation suffered from one drawback - many Greek drug names were left without translation in it, which made it difficult to use it widely. Therefore, in the tenth century, two more new editions of the translation of Istifan ibn Basil were made. The first one was in Cordoba (Spain) by local Arab-Spanish scientists who clarified many terms left without translation. Another edition was made in Samarkand by Abu Abd Allah al-Husayn ibn Ibrahim al-Natili, who later became the home teacher of the young Ibn Sina in Bukhara. In al-Natili's processing, many Greek terms were replaced by Arabic or Persian equivalents. This translation contributed to the wide dissemination of the work of Dioscorides throughout the Muslim East and its popularization. Many famous medieval Muslim authors of Arabic, Persian and Turkic medical works refer to this work of Dioscorides. The Arabic translation of the book of Dioscorides was called *Kitab al-hashaish*, *Kitab al-adwiya al-mufrada*, *Fi al-hashaish wa al-sumum*, etc. [9: 37].

Ibn Sina refers to Dioscorides mainly in Volume II, where he gives descriptions and properties of simple drugs. At the same time, he does not indicate the title of the work, however, a comparison of the material of this volume of the "Canon" with other pharmacological works, where a reference is made to Dioscorides, suggests that Ibn Sina could use the above-mentioned book of *Kitab al-hashaish*. In the "Canon", Dioscorides is quoted 145 times (144 in Volume II, 1 in Volume III).

Paul of Aegina (arab. Bulis) - is considered the last representative of ancient Greek medicine. For a long time he lived in Alexandria. He wrote the medical encyclopedia "Collection of Medicine" (*Kitab al-kunnash fi al-tibb*) of a compilatory nature in seven parts, which was translated into Syriac and Arabic by Hunayn ibn Ishaq [7: 76]. In the "Canon" the name of Paul appears 35 times.

In addition to the ancient physicians cited above, in the "Canon" there are also references to the outstanding Greek physician Oribasius (Arabic Auribasius; 325-402), one of the most famous physicians after Galen in the Muslim East [7: 74]. He is the author of a large medical encyclopedia in 70 books. This is a compilation work, in which sections of medicine are presented in the form of large quotations from the works of Galen, Rufus, Archigen, Dioscorides and other ancient authors. Later, Oribasius made an extract from this encyclopedia in nine articles for his son Eustasius, which is called "Synopsis" [7: 74]. His encyclopedia and its abridgement were translated into Syriac and Arabic by Hunayn ibn Ishaq and his student Isa ibn Yahya [10: 421].

Oribasius also wrote a work on commonly available medicines, which was translated into Arabic by the aforementioned translator of Dioscorides' work, Istifan ibn Basil, and called "The Book of Commonly Used Medicines"

(*Kitab al-adwiyah al-musta'mala*). Unfortunately, all these Arabic translations have not been preserved [7: 75]. Ibn Sina quotes him 6 times in volumes II-IV [2: 582; 3: 262, 284; 4: 525, 542; 5:551]. The same number of references are found on the no less famous Greek surgeon Antillius (Arab. Antilus; II century) was a Greek physician and surgeon of the 3rd century. In his writings, he paid special attention to bloodletting, described the use of blood-sucking jars and notches. Known for his method of bloodletting from an artery, and to stop the bleeding he advised to tie up the artery after bloodletting. He owns a work covering all branches of medicine; in the medical encyclopedia by Oribasius, important fragments on dietetics and surgery from the work of Antillius have been preserved. There is evidence that he also performed eye surgeries [13: 837].

Although there are not many references to Antilla in the "Canon" (6 times), but apparently, Ibn Sina appreciated his professionalism, therefore references to him are found precisely in the part of surgical means and procedures in volumes III-V [4: 95, 173; 5: 246, 247, 255; 6:180]. He is mentioned in the "Canon" specifically in terms of surgical means and procedures in Volumes III-V [4: 95, 173; 5: 246, 247, 255; 6:180].

Compared with other volumes, there are a lot of references to ancient physicians in Volume V, i.e. in the Pharmacopoeia (*Qarabadin* or *Aqrabadin*), where the so-called "author's" recipes of various compound medicines named after their creators are given in large numbers. For example, *taryaq* (antidote) by Andromache, eye medicine by Erazistrat, *iyaraj* (laxative) by Filagria, etc. Most of them are ancient Greek, ancient Roman, Byzantine and Alexandrian practitioners. In total, more than 80 names are mentioned in Volume V, of which more than 50 are physicians of antiquity, which indicates that Ibn Sina was well acquainted with ancient pharmacological literature. In total, the "Canon" contains references to more than 70 ancient Greek and Roman authors.

Along with ancient authors, in the "Canon" there are names of representatives of the Jundishapur medical school, whom Ibn Sina generically calls "Khuzistanis" or Khuz in some places.

Jundishapur medical school functioned in the city of Jundishapur (Persian Gundishapur), founded by the Persian king Shapur I (241-272) in Khuzistan. In the 4th or 5th centuries, a medical school arose here, the main backbone of which was the Nestorians who arrived there at the end of the 5th century for political reasons, from Edessa and the Neoplatonists from Athens. It reached its peak under Nurshirvan (531-579), becoming one of the largest centers of science in the East as a result of the fusion and mutual enrichment of the best traditions of Greek, Syrian, Persian, Central Asian and Indian sciences. From the 5th century, translations of the best Greek medical works into Syriac began, and over time, the development of mainly medical sciences is observed here, which indicated the name of this center as the Jundishapur Medical School. Here, theoretical knowledge based on Greek medicine was reinforced by practical exercises, enriched with medical practice and the body of medicines of oriental medicine, with particular emphasis on the role and function of hospitals [9: 30, 31].

3. RESULT AND DISCUSSION

As a result of the study, it was found that the names of more than 115 scientists were mentioned in the "Canon", the largest number of which is found in the second and fifth books devoted to pharmacology. They are conditionally divided into three groups: scientists of antiquity, physicians of the Jundishapur School and Arabic-writing authors. Ibn Sina, on many issues of medicine, turned to the works of the ancient physicians Galen (129-200) and Rufus (2nd century), references to which are found in all five Books of the Canon, but the largest number of citations falls on Galen - 259, Dioscorides - 145 and Hippocrates - 91 times. It has been established that Ibn Sina also used the medical literature of the physicians of the Jundishapur medical school (6th – 9th centuries), one of the most prolific representatives of which was the famous translator and physician Hunayn ibn Ishaq al-Ibadi (808-873). Ibn Sina used the works of more than 30 Arabic-speaking authors; among whom are the names of the famous polymaths Ya'qub ibn Ishaq al-Kindi (d. 870) and Abu Bakr al-Razi (865-925), but the main part of this group are Syrian physicians-translators who worked in Baghdad and Damascus, who also created their own original works, mainly on pharmacology.

In the "Canon" Ibn Sina mentions the names of two members of the Bukhtyeshu family - Jurjis ibn Jibril (d. 769) and his grandson Jibril ibn Bukhtyeshu ibn Jurjis (d. 828), his student Ibn Masawayh (777-857), Sabur ibn Sahl (d. 869), Hunayn ibn Ishaq al-Ibadi (808-873) and his student Saharbukht (9th century) from among the practitioners of the Jundishapur school. They were outstanding doctors of their time and left a noticeable mark in the history of medicine, as evidenced by the fact that all of them were once invited to the capital of the Arab Caliphate, Baghdad, and served

as court physicians to the Abbasid caliphs. There, at the Baghdad Academy of Mamun (*Bayt al-hikma*), they continued the scientific traditions of the Jundishapur school in the field of medicine. For example, Jurjis ibn Jibril was in charge of the Jundishapur hospital, in 765 he was recalled to Baghdad, where he initiated the translation of Greek medical works into Arabic [7: 77]. His grandson Jibril ibn Bukhtyeshu served with the famous vizier of the Abbasid caliphs Ja'far al-Barmaki, then with the caliphs themselves Harun al-Rashid and his son Ma'mun. He took part in the collection of Greek medical works and supervised their translations [7: 79]. It should be noted that other above-mentioned physicians of the Jundishapur school took an active part in the translation activities in Bayt al-Hikma. Work in this direction was put on a permanent basis, i.e. here a school of translators was formed on the principle of a teacher-student, which can be traced in the chain: Jibril ibn Bukhtyeshu ibn Jurjis → Ibn Masawayh → Hunayn ibn Ishaq → Sakharbukht. Of this chain, the most prolific translator of medical writings is Hunayn ibn Ishaq al-Ibadi, who, under Caliph al-Ma'mun, supervised the translation of Greek works into Syriac and Arabic. He translated over 150 works, including a large number of works by Galen, various works by Hippocrates, Plato, Aristotle, Dioscorides, Ptolemy, Oribasius and Paul. In addition to translations, Hunayn owns about 100 original works on medicine, most of which have not survived [7: 85-86]. In the "Canon" the name of Hunayn ibn Ishaq occurs 16 times, mainly in Volumes II and V, devoted to medicines. The names of other Khuzistanis appear 48 times, also mainly in Volumes II and V.

As for the Arabic-speaking authors, most of them were Christian physicians, of Syrian origin, who lived in Baghdad and Damascus. They, along with translation activities, created original works in Arabic, which by the 9th century had become the state language in the Caliphate and the language of science. In total, the "Canon" contains the names of more than 30 Arabic-speaking physicians, who were referred to by Ibn Sina. Among them are (albeit rare) the names of such famous encyclopedic scholars as Abu Yusuf Yaqub ibn Ishaq al-Kindi (d. 870) - 15 times, Abu Bakr Muhammad ibn Zakariya al-Razi (865-925) - 5 times, and also some famous physicians and translators who served at the court, for example, the Jewish physician of the 8th century Masarjavayh. One of his scientific merits is the translation from Syriac into Arabic of the medical encyclopedia by the Alexandrian physician Aron (7th century), the Arabic title of which is "Medical Collection" (*Kunnash fi-al-tibb*). In addition, he wrote several more treatises on simple medicines and foodstuffs, as well as on substitutes [7: 78]. The last one, called "On Substitutes for Medicines" (*Fi abdal al-adwiya*) was used by many Muslim authors, it has survived to this day [8: 417]. Apparently, Ibn Sina used his work on simple medicines, since the name Mosarjavayh occurs 9 times only in Book II.

But it should be noted that in terms of citation, Arabic-speaking physicians were inferior to ancient authors. This is apparently due to the fact that, as in philosophy and medicine, Ibn Sina was a supporter of the teachings of ancient Greek scientists, so in the "Canon" he preferred to use primary sources, believing that later Arabic-language works could be a compilation or the same Arabic edition of the medical writings of ancient authors. In Volumes I and II there is a rare mention (4 times) of the name of an Indian doctor Charaka (I century), who is also called "Indian" (Hindi). He lived during the reign of the Kushan king Kanishka (1st century). He wrote a work called *Charaka Samhita*, which is considered one of the most significant monuments of ancient Indian medicine [7: 69].

4. CONCLUSION

Thus, the analysis of the source base of the "Canon of Medicine" by Abu Ali ibn Sina showed that when writing his medical encyclopedia, the author used in total the works of over 115 scientists, the largest number of which are found in the second and fifth volumes devoted to pharmacology. In the "Canon" there is a predominance of references to ancient Greek and ancient Roman authors - their total number is more than 70, the most cited of which are Claudius Galen - 259 times and Dioscorides Pedanius - 145 times. Ibn Sina referred to the works of representatives of the Jundishapur Medical School on many issues of medicine - 64 times. Of the five scholars cited, the most prominent figure is Hunayn ibn Ishaq al-Ibadi. Among more than 30 Arabic-speaking authors, there are many Syrian physicians and translators. It is possible that Ibn Sina could use both their translations and original works, mainly on pharmacology. Based on the stated, we can say that the "Canon of Medicine" by Abu Ali ibn Sina was the product of a brilliant analysis, systematization and synthesis of the rich medical heritage of more than a thousand years of the pre-Avicenna period.

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