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## MINI-REVIEW

### The Interaction between Hellenic and Persian Pharmacology: What's the output?

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#### Abstract:

#### Background:

Pharmacology has always been of utmost significance to Persian and Hellenic ancient scientists and presented their viewpoints in medical texts. The aim is to assess the interaction between Hellenic and Persian pharmacologists and the resulting output.

#### Methods:

Using descriptive-analytical method, primary Persian sources written by scholars such as Raban Tabari, Rhazes, Avicenna, and Jorjani, and also the works by prominent Greek scholars including *Theophrastus*, *Hippocrates*, *Dioscorides*, and *Galen* were searched using selected keywords, based on inclusion and exclusion criteria, without time limit in domestic and foreign databases. Finally, the PRISMA diagram was drawn.

#### Results:

Studies show that Persian and Greek doctors have tried to develop the concepts of pharmacology and its applications interactively. In this research, pharmacology in Persian and Greek medical traditions is studied, and their mutual contributions are depicted. The concepts of medicine and pharmacology in Greek and Persian medicine are first analyzed. The reciprocal impacts of these two schools of pharmacology are explored, and at the end, the Persian scholars who have cited Greek scholars in their works are introduced.

#### Conclusion:

With the expansion of territories, ancient theories from the farthest lands entered the realm, introducing new drugs and ideas, which by the critical approach of the Persian scholars were sometimes modified and developed.

**Keywords:** Pharmacology, Greek medicine, Persian medicine, Cure, Drug, Hellenic and persian pharmacologists.

#### Article History

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## 1. INTRODUCTION

Since the beginning of their creation, human beings discovered that some natural materials could heal or relieve pain, which they later called drugs [1]. A drug is a substance that can alter the function of cells and organs [2]. However, according to Avicenna (980-1037 AD), the best medical school is the one that never prescribes drugs [3]. On the other hand, Hippocrates (460–377 BC) says that disease is first treated with medicine, surgery, and finally, cauterization. If it is not cured even by cauterization, it is not curable. Medication was just one of the three most essential treatments [4].

Medicine and medication in ancient Persia had a valuable status. In the Achaemenid period, the medical achievements of other nations were welcomed in Persia, and their knowledge in that field was fully adapted and used. There was a knowledge of medicine and pharmacy in ancient Persia before the Avestan period. With the advent of Zarathustra, a distinguished physician, this knowledge, together with various other sciences, spread and extended to other civilizations [5, 6].

The present study deals with the impact of two medical schools of Persian Greek on medicine progress, especially pharmacy.

## 2. METHODS

In this descriptive-analytical library research, the first

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articles related to pharmacology, pharmacology works, Greek medicine, Persian medicine, Unani Medicine, Rhazes, and Hippocrates, were done in databases Ovid, Pubmed, Science direct. After saturating the information according to PRISMA's statement, the articles were screened (Fig. 1), and finally, the report was taken into note. Also, to examine the books of prominent sages of Persian and Greek medicine in more detail, such as the book *Al-Hawi Fi Al-Tib (Liber Continens)*, *Al-Qanun Fi Al-Tib (The Canon of Medicine)*, *Hippocratic Corpus*, and *De materia medica*. After completing the notes, collecting related materials, and analyzing them, each was placed in the appropriate place in the article. Finally, the final summary and research were presented.

### 3. RESULTS

On the one hand, pharmacological terms in Greek have been derived from the Pahlavi language. Throughout the later developments, drugs such as camphor and tamarind entered the Islamic pharmacopeia, which did not exist in Greek sources [7 - 9]. On the other hand, the influence of Greek pharmacology on Islamic pharmacology was tremendous and widespread. Many of the drugs and pharmacological terms in Persian-Muslim pharmacopeia in Arabic and Persian are derived from Greek. The word "Qarabadin," meaning pharmacology book, is

taken from the Greek word graphidion, meaning "booklet." Other examples include theriac, stater, apisinton, skilla and staphylinos [10].

#### 3.1. The influence of Persian Civilization on Greek Medicine

According to various sources, in the 5th-3rd centuries BC, the Greeks were very advanced in science and technology, especially medicine. Achieving these fantastic advances, especially in a short time, is practically impossible without a previous scientific background. For example, even the Greeks themselves called The theory of the four humours (blood, phlegm, yellow bile, black bile) a foreign and Iranian hypothesis. Generally, Hippocrates' works and speeches are pretty new, and there is no sign of gradual scientific evolution. Naming compounds and buildings as common everyday objects, naming body parts with Indian and European roots, and the abundance of Babylonian names are examples of these [11].

Regarding the influence of Persian pharmacy in different eras, Professor Howard writes: "*The creator and innovator of modern chemistry and modern pharmacy is Rhazes. It must be admitted that the new pharmaceutical system is the product of Rhazes's experiments on animals* [12, 13]".

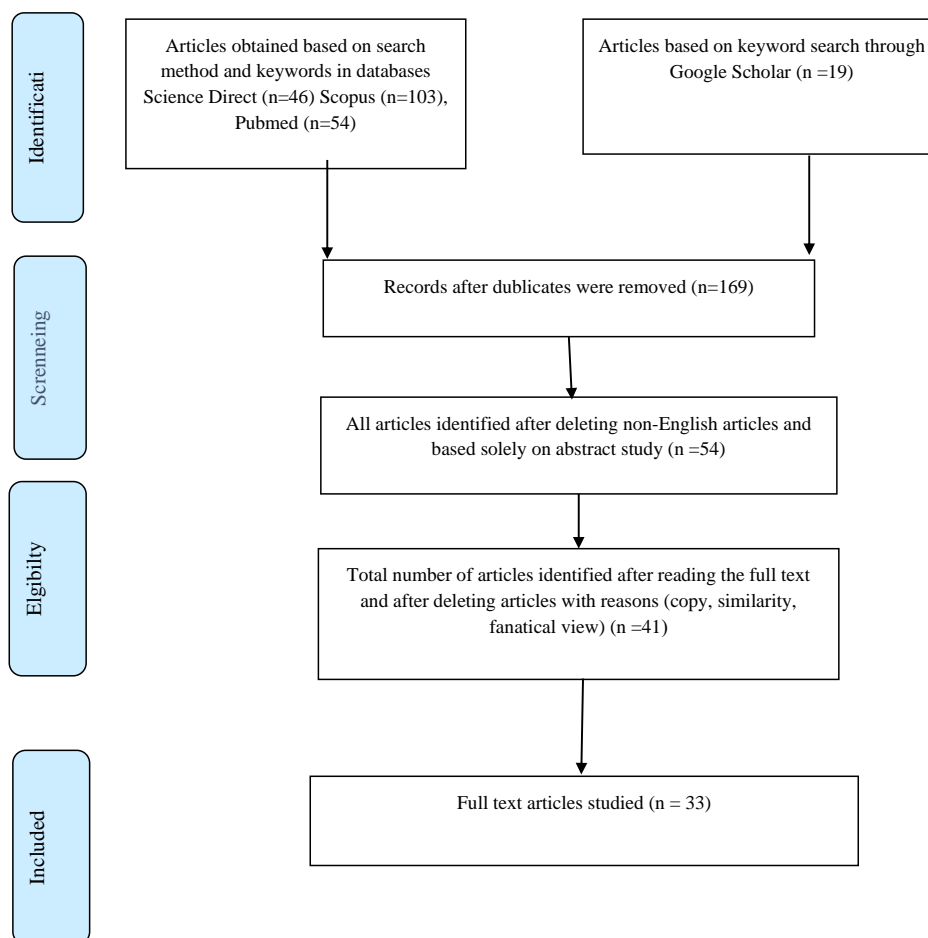


Fig (1). PRISMA flow chart for search and article selection method.

### 3.2. Greek Medicine and its Impact on the Persian School of Medicine

In ancient Greek medicine, the prescription of drugs was only one of the three most important treatment methods. The other two were regimen and surgery. It was a very privileged categorization in the healthcare sector because the doctor had to have a comprehensive overview of the human body for treatment and preserving the body's balance. There is very little information about pharmacology in early Greek poetry (the 8<sup>th</sup> century BC). In Iliad, the drugs used were mentioned only briefly. The medications used in the Iliad and Odyssey were not named [12, 14].

In ancient Greece, making, preparing, and prescribing drugs were done by doctors or under their supervision, but sometimes the professions of physicians and pharmacists were not sharply differentiated [15]. The wine was the basis of many drugs as it had different effects when consumed because alcohol alleviated the person and affected skill control. However, regarding addiction to it and its damaging impact, some Christian sects demanded the destruction of all vineyards [16].

The way the Greek knowledge reached Iran, the Achaemenid Empire highly respected scholars and experts. Among prisoners who fell into the hands of the Persians in wars or refugees who sought asylum in the Achaemenid Empire, the craftsmen and scholars were treated with open arms. The physicians had a special place in the Achaemenid court, a fact many sources prove. One of the famous Greek doctors who served in the Achaemenid court was Katzias [17]. After Alexander's invasion and the spread of Greek culture in Persia, there established a very influential university-based on Greek sciences during the Sassanid period, which remained active even long after the advent of Islam. In addition, it served as one of the reasons why Muslims in the early centuries of the Islamic era became interested in Greek medicine [18].

According to the existing documents, Theophrastus (287-371 BC) was the first person in the West and ancient Greece to specialize in studying plants in a specialized way. He wrote extensively about plants, minerals, and perfumes. He described more than 500 plants by their morphology, biological properties, and medicinal uses [19]. After him, Diocles of Carustius wrote the oldest known book on medicinal plants around 295 BC, and the peak of Greek pharmacology emerged in the first century AD. A scientist named Dioscorides wrote a pharmacopeia called *De materia medica* in 5 volumes, which remained valid until the 17th century [20, 21]. After him, Galen introduced various cooling ointments in pharmacology. The development of pharmacology culminated in the time of Galen but declined in the 3rd century AD with the collapse of the Roman Empire and the dominance of spiritual healing ideas. At this time, Muslims rescued it from decline by translating a Greek pharmacology book and adding new material to it. The Iranians of the Islamic era continued the path of pharmacological development and surpassed the knowledge of Theophrastus and Dioscorides.

This tradition reached its peak in the Safavid period, which was called the "Golden Age of Pharmacology." Muslims

divided drugs into compound and specific categories and called them "aqiqir." There were several types of drug books in the field of toxins, including a list of combination drugs. Rhazes, an Iranian scientist, was one of the first scientists to make chemical drugs in the laboratory. He referred to 800 medications (primarily herbal) and discussed pharmacology's theoretical and practical foundations. In addition, Abu Rihan al-Biruni (937-1048 AD) was known as the founder of native botany in pharmacy. In addition, Iranian physicians reject the old idea that bad-tasting drugs work best. Instead, they made great efforts to make their forms of medicine by covering the tablets with gold or silver foil (gilding or silvering) and using sweeteners. They also preserved pharmacological knowledge by translating a variety of books. In the tenth century AD, with the resurgence of medical science in Europe, these books were translated from Arabic into Latin and taught in emerging European universities such as Salerno [12, 19].

### 3.3. Greek Scientists Cited by Persian Scholars

Muslim Persian medical practitioners used to refer to the Greeks in their works. However, Muslim scholars never dogmatically followed the writings of Greek scientists. They transformed the raw materials from Greece and Persia and evolved a new school of medicine based on their own experience. When Islamic physicians started to study the works of the ancient scholars critically, they managed to write over a thousand books in medicine that greatly surpassed all the books of the olden time of Hippocrates. They highly influenced the works of their successors up to the 16th and 17th centuries [11, 12, 22].

Following are some of the essential Persian botanists and pharmacologists who cited Greek scholars in their works.

#### 3.3.1. Ali ibn Sahl Rabban Tabari (838-870 A.D.)

Ali ibn Rabban Tabari was the first great Islamic physician at the beginning of the eighth century A.D. *Ferdos al-Hakma* cited 20 new plants that the Greek scientists had not identified, with Persian and Arabic names. He combined Hippocratic and Galenic medicine with Indian knowledge [23 - 25]. Ibn Rabban in *Ferdos al-Hakma* referred to Galen repeatedly: "*The Galenic pill is good for neutralizing dense and sticky phlegms and beneficial for treating headache* [26]".

#### 3.3.2. Mohammad ibn Zakaria Razi (865-925 A.D.)

The role of Mohammad ibn Zakaria Razi (Latinized as Rhazes) in Islamic medicine is similar to that of Hippocrates in Greek medicine [24, 27, 28]. Perhaps, it can be said that Rhazes and Avicenna founded modern western medical science by enriching the Greek medical tradition. The books of these two scholars, *Al-Mansouri Fi Al-Tib* (The text on medicine dedicated to al-Mansour) and *The Canon of Medicine*, were studied as important books throughout Europe. They are still in use in different libraries in different libraries Europe [29, 30]. Rhazes is the first person who benefited from Hippocratic writings on a large scale for the formation of his medical system. He also set the principles of Hippocrates as his guidelines in the practice of medicine. In *Al-Hawi Fi Al-Tib* (the comprehensive book on medication), Rhazes cited

Pedanius Dioscorides [24, 31, 32].

### 3.3.3. Al-Biruni (973-1048 AD.)

Abu Rihan Muhammad ibn Ahmad Al-Biruni, known as Al-Biruni in English, wrote the famous book "*Kitab al-saydala fi al-Tibb*" (Book on Pharmacopoeia), contemporary with Avicenna. He had excellent knowledge of botany and wrote his book using the legacy of his predecessors (especially the book of *Materia medica*). In *Kitab Al-saydala fi al-Tibb*, about 770 plants were described with their derivatives and therapeutic characteristics, except for synonyms and referrals. Another aspect of the book was that the writer had abundantly mentioned the identical names of plants in different languages, such as Greek, Latin, Syriac, Arabic, Persian, and Turkish, and even in other local languages [33, 34]. Al-Biruni, in this book, referred to about 250 former writers. Most of the words in this book are Greek and Syriac [13].

### 3.3.4. Avicenna (980-1037 AD.)

This renowned Persian physician has been considered the great scientist of the world since the extinction of the Greek civilization. In the second volume of *the Canon of medicine*, he managed to simplify the complicated prescriptions of Galen [35]. Also, here and there in his book, he quoted Dioscorides explicitly or implicitly [35].

### 3.3.5. Abu Mansur Muvaffak Harawi (10 th Century)

Abu Mansur Muvaffak Harawi, in his first treatise on pharmacology, *Al-Abnieh a Haghayegh al-Advieh*, spoke of 585 medications, providing information on Greek, Syriac, Arabic, Persian, and Indian Pharmacology [36]. In his book, he repeatedly referred to Plato, Galen, Pholus, Hippocrates, Dioscorides, Estethalis, and Eslidos. For example, in describing tarragon (*Artemisia dracunculus*), he wrote: "*And Paulus Aegineta says that it is bad for the stomach and is challenging to digest, and it is composed of two opposing substances* [37]".

### 3.3.6. Seyyed Esmaeil Jorjani (1042-1137 A.D.)

Jorjani compiled *Zakhireh Kharazmshahi* (Treasure of Kharazmshahi) in the Persian language. In describing the properties of Coriander, in addition to Muslim physicians, he mentions several Greek physicians who reflect his study of the writings of various nations and scientists. he writes: "*Coriander is bitter, astringent and delicate, and is said to be cold at first and dry at second degree. Ibn Jerih, however, believes it to be dry at the third degree. Galen says it has a warm tendency. However, Avicenna says this warm nature is subtle and soon evaporates; it causes cold and harms if overeaten. Galen believes it to be warm in apposition to Dioscorides, Rufus, Arkaghanis, and others who believe it cold. The reason, according to Galen, is that it weakens the Khanzeer disease (scrofula), Tuberculosis of the lymph nodes* [38]".

### 3.3.7. Haji Zayn Attar (14th-century)

*Ikhtiyarat Badiee* is the only book written by Hajji Zayn al-Din Ali ibn Hussein available today. The book contains traditional single and compound medicines. The author

dedicated the reader to the princess Badia al-Jamal, hence the name of the book *Ikhtiyarat Badiee*. Hajj Zayn al-Atar benefited from the works of his predecessors, both the Greeks, by translation and Persian writers. He critically studied the ideas of about 30 physicians in his book. However, he referred to two excellent books as his primary sources: *Ibn baytar's Al-jama fi al-adwiya mofrada* and *Ibn Jazlah's Minhaj Al-bayān* books. Also, Galen and Dioscorides are repeatedly referred to [25, 39].

### 3.3.8. Mohammad Momen Tonekaboni (16th century)

Tonekabni, in his book *Tohveh Hakim Momen*, incorporated the Indian and Greek knowledge with his experiences and discoveries about medicinal plants and described them alphabetically [40]. He repeatedly referred to Greek scientists and physicians in his book, including Galen, Hippocrates, Plato, Aristotle, Dioscorides, Ptolemy, Oribasius, and Paul and Hermes. For example, under the entry of oyster, he quoted Galen: "*And Galen states that the Indian oyster is excellent for heart pain relief and, when it is ground and applied with vinegar to the parotids, it permanently cures headache and cold* [41]".

### 3.3.9. Seyyed Mohammad Hossein Alavi Aghili Khorasani (18th century)

His most important work was the *majma al javameh* (the Most Comprehensive Book), which itself included 3 books of *the Great Qarabadin*, *Makhzan al Advieh* (the Treasure of Drugs), and *Kholasat al Hekma* (the Summary of Medical Science). As an example, in the book of the *Great Qarabadineh* on the combination of *antidote Farouk* (*theriac-farouk*), he explained:

"*The antidote Farouk was developed in the course of one thousand four hundred and sixty-nine years due to the endeavors of nine great scholars, that is, Andromachus I, Euclid, Philagrius, Faraghlis, Pythagoras, Marinus, Magnus of Mesa, Andromachus II, and Galen. All, except Galen, tried to improve it. Galen did not change it as it had come to ultimate perfection by Andromachus II* [42]".

## CONCLUSION

In conclusion, it is possible to determine that the Islamic school of medicine had a significant role in preserving the pre-Hellenic knowledge of pharmacology. In addition, Islamic civilization added a lot to this knowledge to the extent that pharmacology was recognized as one of the epochs of Islamic culture. With the expansion of Islamic territories, ancient theories of farthest lands entered the realm of Islam, introducing new drugs and ideas, which by the critical approach of the Islamic scholars were sometimes modified and developed.

## CONSENT FOR PUBLICATION

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## CONFLICT OF INTEREST

The authors declare no conflicts of interest, financial or otherwise.

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