

Great doctors and scientists from the East: from princes of Persia, to icons of Asian science

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Abstract

Asian scholars especially from Iran and China preserved most of the wisdom and knowledge of antiquity in their writing and they had great influence even on both European traditional and modern medical sciences. The current searching was done by the keywords in main indexing systems including PubMed/MEDLINE, Scopus and Institute for Scientific Information Web of Science as well as the search engine of Google Scholar. Avicenna famous book was Canon, which reviewed all medical knowledge studied by the ancient Greek and Muslim scientists. Avicenna has introduced many medicinal plants and herbs and its knowledge influenced by both Eastern and Western traditional science. Rhazes was a great Persian alchemist, musician, mathematician, philosopher and physician. Bian Que was one of the most famous medical man and physician in ancient China who attached particular importance to the changes in the pulse examination. He is known as the founder of traditional Chinese medicine, and his four diagnostic methods were inspection, smelling and listening, inquiry, and palpation. Hua Tuo, Zhang Zhongjing, and Ge Hong were eclectic philosophers who dedicated his life to searching for physical immortality and traditional Chinese medicine, which he thought was attainable through alchemy. Sun Simiao also valued sanitation, exercise and disease prevention. Li Shizhen, a famous Chinese scholar who compiled a highly influential material medica. It is recommended to survey on their rules in different majors with details in future studies to make a better connection between modern and historical medical science.

Keywords: Avicenna; Bian Que; Hua Tuo; Rhazes; Traditional Chinese Medicine; Zhang Zhongjing

Introduction

Persian traditional medicine or Iranian traditional herbal science is one of the most ancient forms of traditional medicine which has important impacts on many countries not only in Asia, but also in all over the world. Avicenna, an Iranian physician and philosopher which has both scientific fame and influence in Iran and the whole world. Abu Bakr Muhammad Ibn Zakariyya al-Razi which is known as Rhazes, was celebrated alchemist, Persian physician and philosopher who has been considered the greatest physician of his era. Chinese herbal plants have been studied and used for many medical problems, including stroke, heart disease, respiratory diseases, mental disorders and etc for many years (Shahrajabian *et al.*, 2020a,b,c). Increasingly attracting

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worldwide attention, traditional Chinese medicine is a natural therapy, safe, effective and widely used in many Asian and non-Asian countries (Shahrajabian *et al.*, 2020d,e,f,g). Traditional Chinese medicine is a system of medicine based on acupuncture, acupressure, Chinese herbs, cupping, diet and moxibustion. It is also heavily rooted in traditional Eastern philosophy which has not originated in only one era of Chinese history or by one Chinese scholar (Shahrajabian *et al.*, 2019a,b,c; Sun *et al.*, 2021a,b,c). Top 6 famous Chinese physicians are Bian Que, Hua Tuo, Zhang Zhongjing, Ge Hong, Sun Simiao and Li Shizhen. Top 6 famous Chinese physicians and their time have been mentioned in Table 1. The goal of this manuscript is to introduce the most important physicians in Iran and China and their contribution in progress and development of both traditional and modern medical sciences. FF

Table 1. Top 6 famous Chinese physicians

Chinese physician	Status or details	Time
Bian Que	Ancestor of traditional Chinese medicine	310-407 BC
Hua Tuo	Ancestor of surgery	145-208 AD
Zhang Zhongjing	Sage of traditional Chinese medicine	150-215 AD
Ge Hong	Ancestor of first aid	284-364 AD
Sun Simiao	King of the traditional Chinese medicine	541-682 AD
Li Shizhen	Sage of medicine and herbs	1518-1593 AD

Iranian Scholars

Avicenna

Avicenna was a great Persian physician and polymath, who made a tremendous contribution to the medicinal science (Khan *et al.*, 2020). He was also known as Ibn Sina (Abu-Ali al Husayn inb Abdalla Ibn Sina) (979-1037 AD). His famous book was Canon of Medicine which went on to become a reference textbook of medicine in the region and the West, and he can be regarded as pioneering in the fields of urology and gynecology (Araj-Khodaei *et al.*, 2020, Mazengenya and Bhikha, 2020). The first medical study of facial paralysis is attributed to him, and he was the first to record differences between central and peripheral facial paralysis (Fumagalli, 2019). He is also the largest representative of advanced socio-humanitarian ideas among the people of Central Asia, who paid great attention to the prevention of diseases rather than their treatment and recommended the use of herbal medicines and biologically active points for various diseases (Buranova, 2015). Avicenna developed a systematic and hierarchical doctrine of truth that culminates in God as the First Truth that causes all contingent truths to exist (De Haan, 2018). Avicenna did say, medicine is the science by which we learn the various states of the human body, in health, when not in health, the mean by which health is likely to be lost, and when lost, is likely to be restored to health. Although, Avicenna is known to have been a major influence on both medical practice and the development of logic in medieval Europe, two important doctrines of Ijma and Stoic logic transmitted via the writings of Galen has more influence on his thoughts (Shoja *et al.*, 2011). Avicenna revised the knowledge of the ancient scholars through critical thinking and relying on observation and testing, systematized the science of medicine and introduced many ideas and innovations (Sadeghi *et al.*, 2020). Avicenna believed that moral descriptions like good and bad are not descriptions of realities and moral judgments are not propositioning (Safari, 2020). He is famous as the father of modern medicine and his teachings reached beyond the East and West (Aligabi, 2020).

Avicenna suggested that the true cause of pain was a change of the physical condition (temperament change) of the organ whether there was an injury present or not (Tashani and Johnson, 2010). Avicenna adopted the practical approach to the descriptions of the human body and the diseases associated (Mazengenya and Bhikha, 2018). Avicenna has tried to find out the causes of heart diseases and classify them in accordance with the different signs and symptoms (Turgut *et al.*, 2010). The term *al-sin* (the Arabic word for China) is used 46 times in Avicenna's Canon of Medicine in reference to herbal drugs imported from China, especially

cinnamon, wild ginger, rhubarb, nutmeg, incense tree wood, cubeb and sandalwood (Heydari *et al.*, 2015). Avicenna advised filafeli juice (a compound with pepper) and dry coriander for treatment of excessive belching, and he also suggested cooling the temperament with cold temperament foods and the fruit paste for simple smoky belching; for excessive belching with an excess of humor, he proposed wormwood (*Artemisia absinthium* L.) to strengthen the stomach and Ayarij (*Aloe vera*, the dried juice of leaf), which is a purgative compound to discharge excess materials (Chaichi-Raghimi *et al.*, 2020). Avicenna did know about the correlation between the heart and erectile dysfunction (ED), but the association between the cardiovascular system and this disorder has just found by scholars (Zohalinezhad and Zarshenas, 2014).

The most important examples of functional foods in *the Canon of medicine* were *Anethum graveolens* L., *Beta vulgaris* L., *Brassica oleracea* L., *Brassica rapa* L., *Cicer arietinum* L., *Citrus lanatus* (Thunb.) Matsum. & Nakai, *Cucumis melo* L., *Cucumis sativus* L., *Cucurbita pepo* L., *Daucus carota* L., *Hordeum vulgare* L., *Lactuca sativa* L., *Lens culinaris* Medik., *Mangifera indica* L., *Matricaria chamomilla* L., *Portulaca oleracea* L., *Spinacia oleracea* L., *Vigna radiate* (L.) R. Wilczek., and *Vitis vinifera* L., and examples of absolute medicament or drug in *the Canon of medicine* were *Cinnamomum camphora* (L.) J. Presl, *Cinnamomum verum* J. (Presl), *Foeniculum vulgare* Mill., *Nymphaea alba* L., *Piper nigrum* L., *Syzygium aromaticum* (L.) Merrill & Perry, and *Zingiber officinale* L. (Soleymani and Zargaran, 2018). Avicenna has his own theories about time of collection of plant parts; he believed the best time of collection of flowers and fruits are when they have reached full bloom but have not dried up to fallen, and when full matured but before they fall down, respectively. The best time for collections of leaves is when they have attained their full size, the withered, discolored, shattered and also fallen ones should not be taken, and the suitable time for collection of roots is when the plants on the threshold of shedding their leaves; Moreover, the appropriate time of seeds' collection is when their mass condensed and their rawness and moisture have been disappeared (Faridi *et al.*, 2010). He had a great impact on the physicians who lived after him, especially regarding cardiology (Mahmoudi Nezhad and Dalfardi, 2014). Different books of Avicenna about medicinal sciences have shown in Table 2. Six essential lifestyle factors which were described by Avicenna have been shown in Table 3. Avicenna's perspective on teachers' professional ethics have been presented in Table 4. Avicenna and his knowledge in treatment of various diseases are shown in Table 5. Five most important sections of *Canon of the Medicine* are presented in Table 6. Three basic principles of treatment with medication highlighted by Avicenna are shown in Table 7. List of herbs from the heritage of Avicenna used by scientific medicine at present are presented in Table 8. Medical herbs described by Avicenna and used in modern medical products are shown in Table 9. Medicinal herbs with hepatoprotective/hepatotherapeutic effects which were mentioned from *Canon* book 2 are indicated in Table 10. The medicinal herbs which were found effective against spleen disease on the basis of second volume of *Canon* are shown in Table 11. Anti-inflammatory (AI) and analgesic (AG) substances introduced by Avicenna in his book are shown in Table 12. Medicinal plants for the treatment of bloating on the basis of Avicenna's book are presented in Table 13.

Table 2. Different books of Avicenna about medicinal sciences (Naderi *et al.*, 2003; Turgut *et al.*, 2010; Choopani *et al.*, 2012; Emtiaz *et al.*, 2012; Emtiaz *et al.*, 2013)

Book's name	Key point
Kolliat	*The first book concerned with medical principles and general anatomy.
Mofradat	*The second is a reference for material medica.
The third book	*The third book contains organ-specific diseases.
The fourth book	*The fourth discusses systemic illnesses and traumatic injuries.
Qarabadin	*The fifth book contains descriptions of compound drugs
Qanun (Canon)	*Qanun reviews all the medical knowledge studied by the ancient Greek and Muslim scientists. *He did focus on the ancient tradition of the four humors (blood, phlegm, yellow bile, and black bile)

Table 3. Six essential lifestyle factors which were described by Avicenna

Factors	Key points	Reference
Air	<p>a. According to his book, air is a strengthening factor which acts as a modifying and purifying in the human body.</p> <p>b. The air changes divided into two categories, normal and abnormal changes. Normal changes mean the seasonal changes because in every season the air changes into another temperament. Abnormal air changes are of two types, change in the substance, and change in the quality.</p> <p>c. The changes in the quality divided into two categories; homogeneous, for instance intense heat during summer, and heterogeneous, for intense cold during the summer (owing to atmospheric disturbance).</p>	<p>Ibn Sina (1998) Ibn Sina (2005) Babaeian <i>et al.</i> (2016)</p>
	<p>d. Avicenna suggested a number of preventive and curative measures to keep safe from the harms of polluted air, which were moving to mild weather areas and green plains, remaining indoors and shutting windows when the air is highly polluted, having fragrant stuff around, consuming antidotal foods, and foods which increase cardiovascular and mental functions, avoiding, hot, salty foods and avoiding strong emotions such as anger.</p>	<p>Avicenna (1973)</p>
Physical activity (Body movement)	<p>a. Avicenna stated that the effect of physical activity on the human body depends on whether the movement is severe or mild, whether it is prolonged or moderate, whether it is accompanied by the rest.</p> <p>b. Each physical movements has different impacts on the body, and the rest is always cooling and moistening which acts together in stimulating heat.</p>	<p>Ibn Sina (2005)</p>
Sleep and wakefulness	<p>a. Avicenna believed that, the night is the best time to sleep and to sleep during the night is more beneficial.</p> <p>b. When sleep is excessive causes an opposite effect such as dullness of the psychological features, heaviness of head and cold diseases.</p>	<p>Ibn Sina (2005) Ansari (2007)</p>
Psychic movement and response	<p>a. He stated that all psychic conditions are the result of inward or outward movement of pneuma.</p> <p>b. The outward movement of pneuma leads to the coldness of the interior and inward movement of pneuma causes the coldness of the exterior and heat of the interior.</p> <p>c. He argued that the human body is also influenced by psychic states other than psychic notions which may influence physical factors.</p>	<p>Ibn Sina (2005) Choopani and Emtiazy (2015)</p>
Food and waters (drinks)	<p>a. Foods are divided into three categories such as light food (produces diluted blood), heavy food (which produces concentrated blood), and moderate food.</p> <p>b. Also, on the basis of either rich or poor in nutrition, he categorized into 4 parts, 1) light food, rich in nutrition, such as extract of meat, 2) heavy food, poor in nutrition, such as cheese, 3) light food, poor in nutrition, such as apples, 4) heavy food, rich in nutrition, such as beef.</p>	<p>Ibn Sina (2005)</p>
	<p>a. Water does not nourish the body, but it helps to liquefy and carried food into vessels and the channels and rectifies consistency of the food, which shows the role of water in completing the process of nutrition is necessary.</p> <p>b. The best water, is spring water with following conditions, not dominated by any quality, not polluted by extraneous elements, be exposed to the sun and winds, and situated on pure earth.</p>	<p>Ibn Sina (1998; 2005)</p>
Depletion and retention	<p>a. The causes of abnormal retention are weak repulsion, strong retentive force, weakness of digestion (dyspepsia), which leads to long remains in the digestive system to complete digestion, and dyspepsia is one of the worst causes of these disorders., structural disorder such as narrowing and obstruction of the intestines, concentration and viscosity of the material and hence that the repulsion force is unable to conquer them, dystemperament, secondary diseases, such as rupture of intestines, compound diseases such as swelling.</p>	<p>Choopani and Emtiazy (2015)</p>
	<p>a. Several reasons for abnormal depletion mentioned by Avicenna are strong</p>	<p>Ibn Sina (2005)</p>

	repulsive force, weakness of the retentive, the different effects of substances which are in digestive system such as their heaviness, distension and irritation, the watery nature of what has been eaten with the help of dilated channels as occurs in spermatorrhea, and obstruction, usually because of the extreme dryness and occlusion of the channels.	
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Table 4. Avicenna's perspective on teachers' professional ethics (Heidari *et al.*, 2015)

No	Requirements or conditions
1	Skillful teacher needs to possess admirable ethical characteristics in his individual and social dimensions
2	He should attempt to educate his own soul before making any effort in educating others considering some important points
3	It is important for him to have prudence in all his affairs
4	He should not try to educate anybody before being acquainted with his/her traits.
5	He also should be generous and faithful toward the others
6	It is expected from such a kind of teacher to gain a very high level of skillfulness in advising and guiding the learners

Table 5. Avicenna and his knowledge in treatment of diseases

Diseases	Key points	Reference
Ascites	a. Canon of medicine suggests that ascites, including; the treatment of underlying disease, reducing the ascites fluids using diuretics and non-diuretics, and also by providing a hepatoprotective impact which can improve liver function by using life style modification and dietary intervention.	Mahdavi <i>et al.</i> (2015)
Atherosclerosis	a. Avicenna is the first scholar which described the role of spleen in prevention of atherosclerosis.	Emtiazy <i>et al.</i> (2013)
Belching disorder	a. Avicenna has along pointed out the relationship between belching and certain organs.	Chaichi-Raghimi <i>et al.</i> (2020)
	b. He did recommend three main approaches for its treatment, including lifestyle modification, herbal medicines, and physical manipulations.	Chaichi-Raghimi <i>et al.</i> (2020)
Blister disease	a. He did categorized blisters to hot and cold. Hot divided to sanguine and bile, and cold divided to phlegm and black bile. Sanguine categorized to good and bad. Good divided to thick (epidermis and dermis involvement), and thin (Epidermis involvement). Bad also divided to thick (foulabscess), and thin (blush swelling).	Chaichi-Raghimi <i>et al.</i> (2020)
	b. Topical recommended application for hot swellings and ulcers in traditional Persian medicine was <i>Plantago ovate</i> L. (seed mucilage), <i>Plantago major</i> L. (seed mucilage), <i>Portulaca oleraceae</i> L. (seed, aerial parts), <i>Curcuma longa</i> L. (root), <i>Solanum nigrum</i> L. (fruits, leaves), <i>Rosa damascena</i> Mill (flower), <i>Myrtus communis</i> L. (fruit, leaves), and <i>Santalum album</i> L. (bark).	Atarzadeh <i>et al.</i> (2016)
Bloating	a. Nutritional factors of bloating: Nutritional factors such as consumption of types of flatulent food, consumption of fruits with moisture content like cucumber, consumption of stale food and smoked food.	Naseri <i>et al.</i> (2016)
	b. Associate of lifestyle and bloating: Failure to observe the proper lifestyle	Naseri <i>et al.</i> (2016)
	c. Intra-abdominal mechanisms of bloating: Gastric diseases, constipation, weakness of the abdominal wall, intestinal worms.	Naseri <i>et al.</i> (2016)
	d. Miscellaneous factors: Individuals with underlying high moisture and	Naseri <i>et al.</i> (2016)

	low heat, medications, posterior nasal discharge, liver diseases.	
Cancer	a. He underlined that cancer should be diagnosed and cured in the early stages.	Zarshenas and Mohammadi-Bardbori (2017)
	b. In his view, cancer is an atrabilious (black bile) swelling (tumor) which sometimes may be accompanied by pain or swelling. He did mention that some vessels may be appeared around the cancerous part. He extrapolated the cancer with legs of cancer crab which can to grow around the other organs and tissues.	Zarshenas and Mohammadi-Bardbori (2017)
Cataracts	a. Avicenna believed that cataracts could be cured by medication and nutrition in their early stages without the need for surgery. He confirmed that mental status of the patient is an important factor contributing to the postoperative prognosis.	Nejabat <i>et al.</i> (2012)
Cardiac tamponade	a. Avicenna stated that, the heart is placed within a thick pericardium, no other membrane is similar to this one in thickness, it is obvious that if the fluid becomes excessive, it will put the heart under pressure and the heart will be able to dilate.	Dalfardi <i>et al.</i> (2014)
Cardiology	a. His findings are included in his descriptions on cardiac tamponade, stroke, palpitation, atherosclerosis, hypertension, association of the cardiovascular complications with erection and ejaculation, interaction between the heart and emotions as well as some of his mentioned drugs for cardiological disorders and the early concepts of drug targeting.	Zarshenas and Zargaran (2015)
Carotid hypersensitivity syndrome	a. The patients who have excessive yawning, fatigue, and flushing, dropped following pressure on their carotids. Avicenna was the first to note the carotid sinus hypersensitivity.	Shoja <i>et al.</i> (2009)
	b. Avicenna set forth his own version of “theory of spirits” to explain the mechanism of this disease.	Shoja <i>et al.</i> (2009)
Depression	a. He did regard depression as both a mental ailment, and a disorder resulted by the involvement of brain, heart and blood. b. He believed that the main causes of depressive events are rooted in heart diseases; in most cases brain is only affected secondary to the heart. c. He clarified that for the treatment of depressive disorders, the underlying cardiovascular diseases should be considered.	Yousoufpour <i>et al.</i> (2015)
	d. About 30 medicinal herbs have been introduced by Avicenna for treating and managing depression. The most important medicinal plants are <i>Pistacia vera</i> L., <i>Coriandrum sativum</i> L., <i>Hyacinthus orientalis</i> L., <i>Inula helenium</i> L., <i>Echium amoenum</i> Fisch. & C.A.Mey, <i>Terminalia cheb ula</i> Retz., <i>Centaurea beben</i> L., <i>Doronicum pardalianches</i> L., <i>Cyperus longus</i> L., <i>Crocus sativus</i> L., <i>Lavandula angustifolia</i> Mill., <i>Melissa officinalis</i> L., <i>Ocimum basilicum</i> L., <i>Cinnamomum camphora</i> L., <i>Cinnamomum cassia</i> L., <i>Cinnamomum zeylanicum</i> Darsini, <i>Albizzia julibrissin</i> , <i>Ficus carcia</i> L., <i>Phyllanthus emblica</i> L., <i>Saccharum officinarum</i> ., <i>Polypodium vulgare</i> L., <i>Malus domestica</i> Borkh., <i>Citrus medica</i> L., <i>Santalum album</i> L., <i>Taxus baccata</i> L., <i>Curcuma zedoaria</i> , <i>Elettaria cardamomum</i> L., <i>Zingiber zerumbet</i> L., <i>Corallium rubrum</i> ., and <i>Polyporus officinalis</i> .	Araj-Khodaei <i>et al.</i> (2017)
Hemorrhoidectomy discomfords	a. Herbs such as <i>Hypericum perforatum</i> , <i>Cocos nucifera</i> , <i>Anethum graveolens</i> were reported by Avicenna for the management of post-hemorrhoidectomy complications.	Dehdari <i>et al.</i> (2017)
Intestinal	a. Avicenna believed 16 causes were involved in intestinal etiologies of	Moradi <i>et al.</i>

obstruction (Gholonj)	bowel obstruction such as reeh, mucoid phlegm, abdominal hot and dry distemperament, decreased bile secretion, job, and so on.	(2016)
	b. In his view, types of Gholoj were inflammatory gholonj, secretory gholonj, flatulency gholonj, fecal gholonj, parasitic gholonj, and torsion gholonj.	Khadem <i>et al.</i> (2017)
	c. Medical treatment strategies of golonj diseases recommend by him were various and included of procedures, medical herbs and diet recommendations.	Khadem <i>et al.</i> (2017)
Laqve (wry mouth)	a. Avicenna underlined the significance of wry mouth-related disorders and wrote a precise chapter about it.	Aciduman <i>et al.</i> (2008)
	b. To Avicenna the signs of weak type of laqve are facial paresis, hypoesthesia, hypotonia in the facial muscles, insensibility of lower eyelid, and relaxation of one half of the soft palate on the affected side.	Aciduman <i>et al.</i> (2008)
	c. Avicenna described also central facial paralysis by accepting laqve as an alarming sign of cerebrovascular accident. He stated that laqve can also be a preceding sign of epilepsy.	Aciduman <i>et al.</i> (2008)
	d. His treatment methods were based on the paradigm stemmed from the humoral doctrine by Hippocrates.	Aciduman <i>et al.</i> (2008)
Liver and spleen illnesses	a. From the number of drugs, 163 plants from 73 families were found to be effective in treatment of liver and spleen illnesses.	Ghobadi Pour <i>et al.</i> (2019)
	b. 30 non-herbals agents were effective in treatment of liver diseases.	Ghobadi Pour <i>et al.</i> (2019)
	c. The <i>Lamiaceae</i> family has the most effective herbs for treatment of diseases of the liver, spleen or both. Hemp Agrimony, Irsa, and Fudhanj achieved the highest scores.	Ghobadi Pour <i>et al.</i> (2019)
	d. The most important herbs with hepatoprotective effects are berberidaceae, myristicaceae, lauraceae, iridaceae, thymelaeaceae, asteraceae, myrtaceae, terebinthaceae, asparagaceae, araceae, zingiberaceae, anacardiaceae, burseraceae, labiatae, rosaceae, cuscutateae, euphorbiaceae.	
	e. Hepatoprotective herbs mostly prescribed as a part of hepatoprotective compound drugs formula or other formula for liver diseases are <i>Crocus sativus</i> , <i>Pistacia lentiscus</i> , and <i>Cinnamomum spp.</i>	Shamsi-Baghbanan <i>et al.</i> (2014)
Nausea and vomiting	a. The nausea and vomiting associated with almost all major diseases originate from abnormalities in either the quantity/quality of humors.	Nazari <i>et al.</i> (2015)
	b. The gold standard for managing nausea and vomiting is lifestyle modifications with attention to responsible humors.	Nazari <i>et al.</i> (2015)
Optimal fluid intake	a. Avicenna did believe that daily water intake depended on numerous elements together with age, intercourse, body temperament, season, occupation and various internal and external elements.	Nimrouzi <i>et al.</i> (2016)
Pain and neurology	a. Pain-related writings within <i>The Canon</i> were identified and analyzed and compared to Galen and Modern Pain. Galen insisted that injuries (breach of continuity) were the only cause of pain; in contrast, Avicenna suggested that the true cause of pain was a change of the physical condition (temperament change) of the organ whether there was an injury present or not.	Tashani (2019)
	b. Avicenna extended Galen's descriptions of 4 to 15 types of pain and used a terminology which is similar to that use in the McGill Pain Questionnaire.	Tashani (2019)
Periconceptual care	a. Avicenna believed that seminal fluid, sperm, ovum, and developing condition in utero were influenced by the stages of food digestion and the function of some organs.	Ansaripour <i>et al.</i> (2019)

	b. He found that food digestion and function of the organs also depend on each parent's lifestyle and environmental factors.	Ansaripour <i>et al.</i> (2019)
	c. In his view, 6 principles of healthy lifestyle was exercise, nutrition, sleep and awareness, excretion of body wastes and retention of necessary materials, psychic features, as well as air and climate.	Ansaripour <i>et al.</i> (2019)
Pseudocyesis (Raja's Treatment)	a. In contrast with modern physicians, Avicenna expressed difference between mole pregnancy and pseudocyesis.	Mord-Bayati <i>et al.</i> (2018)
	b. Innovation in examination, identification and utilization of targeted treatments are unique features of Avicenna for the treatment of pseudocyesis disorder.	Mord-Bayati <i>et al.</i> (2018)
Rabies	a. Rabies is an acute, progressive and fatal athropozoonotic infection which affect the central nervous system.	Leroy <i>et al.</i> (2006) Willoughby and Slate (2006)
	b. In Iranian traditional medicine, the word rabies means madness which is transmitted through a close contact with infected saliva <i>via</i> bites or scratches.	Hatami (2012)
	c. Avicenna suggested that the imbalance of the four humors causes different diseases like rabies. Based on his view, therapeutic interventions should be done to maintain the balance of humors in the body. He recommended cupping and sucking the site of the bite.	Aghakhani <i>et al.</i> (2017)
	d. In his famous book, he gathered major medical information available from some of his predecessors such as Rhazes (865-925), who described symptoms of rabies and wrote about them, and combined them with his clinical experiences.	Rhazes (2012)
	e. Avicenna described the symptoms of rabies which was caused by a toxic substance in the saliva of a rabid animal and stated that the disease will have a better prognosis if the bite site is bleeding and incurable unless the patient was admitted before hydrophobia, physicians must avoid suturing of the bite wound and leaves sutures open to prevent it from healing if it was sutured by other physicians.	Hatami (2012) Aghakhani <i>et al.</i> (2017)
Renal atrophy disease	a. Avicenna used "Hozal-e-Kolye" in traditional Persian medicine texts. Life style modification and used of some foodstuffs such as camel milk, sheep's milk and <i>Ficus carica</i> recommended in TPM texts as a complementary management.	Mahjour <i>et al.</i> (2017)
Spinal traumas	a. His treatment was based on his etiological diagnosis of such impairments.	Ghaffari <i>et al.</i> (2015)
	b. Following methods have been used to treat spinal traumas: food and drug therapy and regimental therapies such as massage, phlebotomy, cupping, dry sauna, and surgery.	Ghaffari <i>et al.</i> (2015)
Stroke	a. Stoke or cerebrovascular accident (CVA) is caused by a disturbance of the blood supply to the brain and an accruing loss of brain function.	Zargaran <i>et al.</i> (2013)
	b. Avicenna called stroke, sektah and his etiology of stroke are based on humoral theories which cannot compared with medical current concepts.	Zargaran <i>et al.</i> (2013)
	c. On the basis of his book, recognized aetiologic factors included vascular occlusion, cerebral abscess, trauma, and repeated blood-letting. Motor and sensory deficits were described, as was the occasional association with facial palsy, respiratory difficulty, and coma.	Nathan (1992)
	d. Warning symptoms such as severe headache and blackout were known, as was the poor prognosis associated with stroke that follows severe headache, and obesity as a risk factor was identified.	Nathan (1992)

Traumatic injuries	a. Avicenna believed that whenever a fracture occurred in the cranium curing the abscess merely is not reasonable and it is up to the practitioner to cut the skin to find the fracture and treat it as well.	Ghannae Arani <i>et al.</i> (2012)
	b. He believed, it is necessary to accept the bone and the fracture as it is in which there is a quantity of pus until it goes out of it.	Ghannae Arani <i>et al.</i> (2012)
	c. If the poison happens to lie between the bone and the bandage pressing down on it the poison already generated will penetrate from the place to the marrow. Thereafter, it is important to open and cleanse the wound in whatever member other than the head.	Ghannae Arani <i>et al.</i> (2012)
Wound healing	a. In the view of Avicenna, wound healing is a whole body process that the body temperament and well-being closely affects it and factors like total body fluids and quality and quantity of blood and quality of patient's nutrition which may delay or hasten the process.	Hajighasemali <i>et al.</i> (2016)
	b. The treatment of ulcers directly depends on local factors like cleanliness and systemic ones like body nature and temperament and quality of nutrition.	Hajighasemali <i>et al.</i> (2016)
	c. Avicenna believed in burn treatment, which follows two goals, the first goal was prevention of blistering and the second goal was treatment of the burn wound after it created, cold drugs were suitable for the first goal and dry drugs with moderate in cold and hot qualities were better for second goal.	Aliasl and Khoshzaban (2013)
	d. The best herbal drugs for preventing blistering were <i>Myrtus communis</i> L., <i>Acacia Arabica</i> , <i>Platanus orientalis</i> , <i>Areca catechu</i> L., <i>Parietaria</i> off, <i>Lawsonia inermis</i> L., <i>Solanum nigrum</i> L., <i>Malva sylvestris</i> L., <i>Malva neglecta</i> Wallr., <i>Acetum vinegar</i> , <i>Cinnamomum comphora</i> (L.) N. et Ebern, <i>Coriandrum sativum</i> L., <i>Plantago major</i> L., <i>Santalum</i> sp., <i>Rosa centifolia</i> L., <i>Rosa damascena</i> Mill., and <i>Olea europaea</i> L.	Aliasl and Khoshzaban (2013)
	e. Herbal drugs for treatment of burn wound after blistering were <i>Arnebia euchroma</i> (Royle) I. M. Johst, <i>Lens esculenta</i> Moench, <i>Galium verum</i> , <i>Hypericum perforatum</i> L., <i>Trigonella foenum-graecum</i> L., <i>Boswellia carterii</i> Bird, <i>Dolicus lablab</i> , <i>Narcissus tazetta</i> , <i>Pinus</i> sp., <i>Eremurus persicus</i> (Jaub. & Soach) Boiss., <i>Iris</i> spp., <i>Beta vulgaris</i> , <i>Sesamum indicum</i> L., and <i>Olea europaea</i> L.	Aliasl and Khoshzaban (2013)

Table 6. Five most important sections of *Canon of the Medicine*

No.	Content
1	The first book which is devoted to medicine theory, disease prevention and treatment
2	The second book is devoted the doctrine about simple medicines and ways of their action
3	Separate illnesses and their treatment are described in the third book
4	The fourth book is devoted to surgery, doctrine about fevers, etc.
5	Complex medicines and poisons are described in the fifth book

Table 7. Three basic principles of treatment with medication highlighted by Avicenna

No.	Content
1	The first principle (qualitative) involves selecting drugs whose properties are opposite to those of the disease, which stems from the ancient therapeutic principle that treatment received treats the opposite ailment
2	The second principle (quantitative) provides quantification of the degree of heat, cold, humidity and dryness of the medication which is used according to the disease
3	The third is establishment of the dose of medication and climate

Table 8. List of herbs from the heritage of Avicenna used by scientific medicine at present (Buranova, 2015)

Plants (Species)		
1. <i>Acorus calamus</i> L.	19. <i>Datura stramonium</i> L.	37. <i>Plantago major</i> L.
2. <i>Allium cera</i> L.	20. <i>Daucus carota</i> L.	38. <i>Polygonum avicularae</i> L.
3. <i>Allium sativum</i> L.	21. <i>Driopteris filix mas</i> L.	39. <i>Polygonum hydropiper</i> L.
4. <i>Althaea officinalis</i> L.	22. <i>Equisetum arvense</i> L.	40. <i>Populus nigra</i> L.
5. <i>Amygdalus communis</i> L.	23. <i>Ficus carica</i> L.	41. <i>Prunus domestica</i> L.
6. <i>Anethum graveolens</i> L.	24. <i>Foeniculum vulgare</i> Mill	42. <i>Rhus coriaria</i> L.
7. <i>Armeniaca vulgaris</i> Lam.	25. <i>Glycyrrhiza glabra</i> L.	43. <i>Ricinus communis</i> L.
8. <i>Artemisia absinthium</i> L.	26. <i>Gossypium herbaceum</i> L.	44. <i>Rosa canina</i> L.
9. <i>Artemisia vulgaris</i> L.	27. <i>Hyosciamus niger</i> L.	45. <i>Rubia tinctorum</i> L.
10. <i>Berberis vulgaris</i> L.	28. <i>Hypericum perforatum</i> L.	46. <i>Silybum marianum</i> Gaertn.
11. <i>Brassica juncea</i> L.	29. <i>Indula helenium</i> L.	47. <i>Taraxacum officinale</i> Web.
12. <i>Brassica oleraceae</i> L.	30. <i>Linum usitatissimum</i> L.	48. <i>Tribulus terrestris</i> L.
13. <i>Calendula officinalis</i> L.	31. <i>Mentha piperita</i> L.	49. <i>Trigonella foenumgraecum</i> L.
14. <i>Carum carvi</i> L.	32. <i>Oryza sativa</i> L.	50. <i>Triticum vulgare</i> Vill.
15. <i>Chamomilla recutita</i> L.	33. <i>Pastinaca sativa</i> L.	51. <i>Tusilago farfara</i> L.
16. <i>Corchorus olitorius</i> L.	34. <i>Peganum harmala</i> L.	52. <i>Urtica dioica</i> L.
17. <i>Coriandrum sativum</i> L.	35. <i>Persica vulgaris</i> Mill.	
18. <i>Cucurbita maxima</i> Duch.	36. <i>Pimpinella anisum</i> L.	

Table 9. Medical herbs described by Avicenna and used in modern medical products (Buranova, 2015)

Plants (Species)		
1. <i>Apium graveolens</i> L.	7. <i>Juglans regia</i> L.	13. <i>Petroselinum crispum</i> (Mill).
2. <i>Asparagus officinalis</i> L.	8. <i>Pyrus malus</i> L.	14. <i>Pistacia vera</i> L.
3. <i>Cannabis sativa</i> L.	9. <i>Malva silvestris</i> L.	15. <i>Punica granatum</i> L.
4. <i>Citrullus colocynthis</i> L.	10. <i>Melilotus officinalis</i> L.	16. <i>Rosa damascene</i> Mill.
5. <i>Cydonia oblonga</i> Mill.	11. <i>Mellissa officinalis</i> L.	17. <i>Sesamum indicum</i> L.
6. <i>Ferula assafoetida</i> L.	12. <i>Papaver somniferum</i> L.	18. <i>Trachyspermum ammi</i> L.

Table 10. Medicinal herbs with hepatoprotective/hepatotherapeutic effects which were mentioned from Canon book 2 (Ghobadi Pour *et al.*, 2019)

Common name	Scientific Name	Family	Common name	Scientific Name	Family
Onion	<i>Allium cepa</i>	Amaryllidaceae	Cinnamon	<i>Cinnamomum zeilanicum</i> Blume var. cassia Nees Syn. <i>Cinnamomum verum</i>	Lauraceae
Garlic	<i>Allium sativum</i> L.	Amaryllidaceae	Pomegranate, Carthaginian apple	<i>Punica granatum</i> L.	Lythraceae
Pistachio nut	<i>Pistacia vera</i> L.	Anacardiaceae	Jews mallow	<i>Corchorus olitorius</i> L.	Malvaceae
Sumach	<i>Rhus coriaria</i> L.	Anacardiaceae	Kermes	<i>Coccus cacti</i> Syn, <i>Protortonia cacti</i>	Monophlebidae
Ajowan	<i>Carum copticum</i> L.	Apiaceae	Cloves	<i>Caryophyllus aromaticus</i> L.	Myrtaceae

				Syn, <i>Syzygium aromaticum</i>	
Cumin	<i>Cuminum cyminum</i> L.	Apiaceae	Myrtle	<i>Myrtus communis</i> L.	Myrtaceae
Asafoetida	<i>Ferula assafoetida</i> L.	Apiaceae	Oliva	<i>Olea europea</i> L.	Oleaceae
Sagapanum	<i>Ferula persica</i> Willd.	Apiaceae	Maltesa mushroom	<i>Orobancha caryophyllaceae</i> SM <i>Phelypaea coccinea</i> Poir	Orobanchaceae
Wild cumin	<i>Heracleum spondylium</i> L.	Apiaceae	Peony	<i>Paeonia officinalis</i> Retz.	Paeoniaceae
Sweet exudates of saccharum	<i>Calotropis procera</i> R. Br.	Apocynaceae	Poppy	<i>Papaver Glaucium flavum</i> Grant	Papaveraceae Papaeraceae
Hilyun	<i>Asparagus officinalis</i> L.	Asparagaceae	Turmeric	<i>Chelidonium majus</i> L.	Papaveraceae
Small aloa	<i>Aloe littoralis</i>	Asphodelaceae	Fumitory	<i>Fumaria officinalis</i> L.	Papaveraceae
Asphodel	<i>Asphodelus tenuifolius</i>	Asphodelaceae	Rock moss	<i>Peramedia perlata</i> Usnea sp.	Parmeliaceae
Endive, chicory	<i>Cichorium intybus</i> L.	Asteraceae	Abies, fir	<i>Picea abies</i> (L.) H. Karst	Pinaceae
Lettuce	<i>Lactuca sativa</i> L.	Asteraceae	Pine, common fir tree	<i>Pinus pinea</i> L.	Pinaceae
Chamomile	<i>Matricaria chamomilla</i> L.	Asteraceae	Great plantain, multi angled, seven angled	<i>Plantago major</i> L.	Plantaginaceae
Arabian thorn, multi-knotted	<i>Onopordon arabicum</i> L.	Asteraceae	Ispaghola, spogel seed	<i>Plantago ovate</i> Forssk.	Plantoginaceae
Arum	<i>Colocasia antiquorum</i> Schott & Endl.	Araceae	Bug rush	<i>Andropogon schoenanthus</i> L.	Poaceae
Barberry	<i>Berberis aristata</i>	Berberidaceae	Bambo concretion	<i>Bambusa arundinacea</i> Retz.	Poaceae
Horse radish root	<i>Raphanus agria</i>	Brassicaceae	Ribes	<i>Rheum ribes</i> L.	Polygonaceae
Balm of gilead balsam	<i>Commiphora opobalsamum</i> (L.) Engl.	Burseraceae	Purslane	<i>Portulaca oleracea</i> L.	Portulacaceae
Iron wood tree	<i>Mesua ferrea</i> L.	Calophyllacea	Cubeb	<i>Cubeba officinalis</i> Raf.	Piperaceae
Shahdanaj, hemp seed	<i>Cannabis sativa</i> L.	Cannabaceae	Golden threat root	<i>Coptis teeta</i>	Ranunculacea
Spinach	<i>Spinacia oleracea</i> L.	Chenopodiaceae	Black hellebore	<i>Helleborus niger</i> L.	Ranunculaceae
Scammony	<i>Convolvulus camononia</i> ,	Convolvulaceae	Azarole	<i>Crataegus melanocarpa</i> L.	Rosaceae

	<i>Convolvulus scammonia</i> L.				
Dodder	<i>Cuscuta reflexa</i>	Convolvulaceae	Five leaf grass, cinquefoil	<i>Potentilla reptans</i> L.	Rosaceae
Dogwood	<i>Cornus mascula</i>	Cornaceae	Bukhara plum	<i>Prunus domestica</i> L. <i>Prunus spinosa</i> L.	Rosaceae
Colocynth	<i>Citrullus colocynthis</i> L.	Cucurbitaceae	Pear	<i>Pyrus communis</i> L.	Rosaceae
Squirting cucumber	<i>Momordica elaterium</i> L.	Cucurbitaceae	Rose	<i>Rosa damascus</i> <i>Rosa damascene</i> L. Syn, <i>Rosa x damascene</i>	Rosaceae
Sharbin, cedar tree	<i>Chamaecyparis</i> sp.	Cupressaceae	Service tree	<i>Elaeagnus angustifolius</i>	Elaeagnaceae
Indian cypress	<i>Cypress rotundus</i> L.	Cyperaceae	Citron	<i>Citrus medica</i> L.	Rutaceae
Horse tail	<i>Equisetum arvense</i> L.	Equisetaceae	Split cubeb	<i>Zanthoxylum alatum</i> <i>Zanthoxylum alatum</i> Roxb.	Rutaceae
Caper-spurge, myrtle spurge, wild caper	<i>Croton tiglium</i> L.	Euphorbiaceae	Goat willow	<i>Salix caprea</i> L.	Salicaceae
Spurge	<i>Euphorbia pithyusa</i>	Euphorbiaceae	Belladonna	<i>Mandragora officinarum</i> L.	Solanaceae
Castor	<i>Ricinus communis</i> L.	Euphorbiaceae	Winter cherry, alkekeng, bladder	<i>Physalis alkekengi</i> L.	Solanaceae
Soap nut	<i>Caesalpinia bonduc</i> (L.) Roxb. Syn, <i>Guilandina bonduc</i>	Fabaceae	Brinjal	<i>Solanum melongena</i> L.	Solanaceae
Purging cassia	<i>Cassia fistula</i> L.	Fabaceae	Garden night shade	<i>Solanum nigrum</i> L.	Solanaceae
Ceratonia carob, nabatean carob, yanbut	<i>Ceratonia siliqua</i> L.	Fabaceae	Yew	<i>Taxus baccata</i> L.	Taxaceae
Manna	<i>Hedysarum alhagi</i> Lerche.	Fabaceae	Eagle-wood, aloe wood	<i>Aquilaria agallocha</i> Roxb. Syn, <i>Aquilaria agallochum</i>	Thymelaeaceae
Tamarind	<i>Tamarindus indica</i> L.	Fabaceae	Sweet violet	<i>Viola odorata</i> L.	violaceae
Chiratta	<i>Swertia chirata</i> (Wall.) C.B. Clarke.	Gentianaceae	Grape vine	<i>Vitis vinifera</i> L.	Vitaceae
Lac	<i>Coccus lacca</i> Syn, <i>Kerria lacca</i> <i>Ficus laccifera</i>	Kerriidae	Small cardamom, Lesser	<i>Amomum cardamomum</i> L. Syn: <i>Electaria cardamom</i>	Zingiberaceae

	Roxb. <i>Cataris lacca</i>		cardamom		
Spicata spearmint	<i>Mentha sativa</i> L.	Lamiaceae	Cardamom	<i>Amomum cardamomum</i>	Zingiberaceae
	<i>Nepta orientalis</i> Mill.	Lamiaceae	Dried ginger	<i>Zingiber officinale</i>	Zingiberaceae
	<i>Thymus capitatus</i> LK&H.	Lamiaceae			
Origanum	<i>Zataria multiflora</i>	Lamiaceae			
Cassia bark	<i>Cinnamomum cassia</i> auct. Syn, <i>Cinnamomum aromaticum</i>	Lauraceae			

Table 11. The medicinal herbs which were found effective against spleen disease on the basis of second volume of *Canon* (Ghobadi Pour *et al.*, 2019)

Common name	Scientific name	Family
Rock- parsley, Southern wood	<i>Petroselinum sativum</i> Hoffm, nom. Nud	Apiaceae
Terebinth	<i>Pistacia terebinthus</i> L.	Anacardiaceae
Labdanum	<i>Hedera helix</i> L.	Araliaceae
Caper, caprifole	<i>Capparis spinosa</i>	Capparidaceae
White bryony	<i>Bryonia alba</i> L.	Cucurbitaceae
True indigo	<i>Indigofera linifolia</i> (L.f.) Retz.	Fabaceae
Alfalfa	<i>Medicago sativa</i> L.	Fabaceae
Fenugreek	<i>Trigonella foenum-graecum</i> L.	Fabaceae
Hypericon	<i>Hypericum perforatum</i>	Hypericaceae
Teukrion	<i>Teucrium fl anum</i> L.	Lamiaceae
Cat thyme, hulwort, mountain germander	<i>Teucrium polium</i> L.	Lamiaceae
Water lily, sea-kale	<i>Nymphaea lotus</i> L.	Nymphaeaceae
Pepper	<i>Piper</i> sp.	Piperaceae
Lepidium	<i>Plumbago zeylanica</i> L.	Plumbaginaceae
Tamarisk nut	<i>Tamarix gallica</i> L.	Tamaricaceae
Mistletoe	<i>Viscum album</i> L.	Viscaceae

Table 12. Anti-inflammatory (AI) and analgesic (AG) substances introduced by Avicenna in his book (Mahdizadeh *et al.*, 2015)

Scientific name	Common name	Effect
<i>Acorus calamus</i>	Sweet flag	AG, AI
<i>Adiantum capillus-veneris</i>	Maidenhair	AI
<i>Allium ascalonicum</i>	Shallot	AG, AI
<i>Allium sativum</i>	Garlic	AG, AI
<i>Almond oleum</i>	Almond oil	Ag, AI
<i>Alsidium helminthocorton</i>	Corsican	AG

<i>Althaea officinalis</i>	Marshmallow	AG, AI
<i>Anacyclus pyrethrum</i>	Pellitory	AG
<i>Anemon cronaria</i> <i>Anemone coronaria</i>	Anemone	AG
<i>Pimpinella anisum</i>	Aniseed	AG, AI
<i>Anethum graveolens</i>	Dill	AG, AI
<i>Apium graveolens</i>	Wild celery	AG, AI
<i>Aquilaria malaccensis</i>	Aloes	AG, AI
<i>Artemisia absinthium</i>	Wormwood	AG, AI
<i>Atropa belladonna</i>	Nightshade	AG
<i>Asarum europaeum</i>	Cabaret	AG, AI
<i>Asparagus officinalis</i>	Asparagus	AG, AI
<i>Asphodelus ramosus</i>	Asphodel	AG, AI
<i>Avenae fatua</i>	Oat	AI
<i>Bambagia</i>	Cotton plant	AG, AI
<i>Berberis vulgaris</i>	Barberry	AG, AI
<i>Boswellia serrata</i>	Frankincense	AG, AI
<i>Brassica oleraceae</i>	Cabbage	AG, AI
<i>Brassica Spp.</i>	Mustard	AG
<i>Cannabis sativa</i>	Hemp	AI
<i>Carthamus tinctorius</i>	Safflower	AG
<i>Carum carvi</i>	Caraway	AG, AI
<i>Cheese</i>		AG
<i>Cassia fistula</i>	Golden shower	AG, AI
<i>Castor oleum</i>	Castor oil	AI
<i>Centaurea cyanus</i>	Cornflower	AG, AI
<i>Chrysanthemum parthenium</i>	Feverfew	AG
<i>Cicer arietinum</i>	Chana	AG, AI
<i>Cichorium intybus</i>	Chicory	AG, AI
<i>Cicuta maculate</i>	Hemlock	AG, AI
<i>Cocos nucifera</i>	Coconut	AG, AI
<i>Colchicum autumnale</i>	Meadow saffron	AG, AI
<i>Commiphora myrrha</i>	Myrrh	AG, AI
<i>Commiphora gileadensis</i>	Balsam of mecca	AG, AI
<i>Convolvulus scammonia</i>	Scammony	AG, AI
<i>Coriandrum sativum</i>	Coriander	AG, AI
<i>Corylus avellana</i>	Common hazel	AG, AI
<i>Crocus sativus</i>	Saffron	AG, AI
<i>Cucurbita pepo</i>	Pumpkin	AG, AI
<i>Cupressus sempervirens</i>	Pencil pine	AG, AI
<i>Curcuma longa</i>	Curcuma	AG, AI
<i>Cyclamen coum</i>	Sowbread	AG
<i>Cymbopogon schoenanthus</i>	Sweet rush	AG, AI
<i>Cynara cardunculus</i>	Artichoke	AG, AI
<i>Daucus carota</i>	Carrot	AG
<i>Elettaria cardamomum</i>	Cardamom	AG, AI
<i>Chees Ferment</i>	-	AG, AI

<i>Faba vulgaris</i>	Broad bean	AG
<i>Ferula assafoetida</i>	Stinking gum	AI
<i>Ferula gumosa</i>	Galbanum	AG, AI
<i>Ficus carica</i>	Common-on fig tree	AG, AI
<i>Foeniculum vulgare</i>	Fennel	AG, AI
<i>Flores acacia</i>	Acacia	AG, AI
<i>Fraxinus excelsior</i>	Ash tree	AG, AI
<i>Fumaria perriiflora</i>	Fineleaf fumitory	AG
<i>Gentiana lutea</i>	Gentian	AI
<i>Glycyrrhiza glabra</i>	Liquorice	AG, AI
<i>Hedera helix</i>	Ivy	AG, AI
<i>Helleborus niger</i>	Christmas rose	AG, AI
<i>Hordeum vulgare</i>	Barley	AI
<i>Hyssopus officinalis</i>	Hyssop	AG
<i>Illicium verum</i>	Anise	AG, AI
<i>Iris florentina</i>	Iris	AG, AI
<i>Jasminum officinale</i>	White jasmine	AG, AI
<i>Juglans regia</i>	Walnut	AG
<i>Lactuca sativa</i>	Lettuce	AI
<i>Lantago psyllium</i>	Flea wort	AG
<i>Laureo oleum</i>	Laurel oil	AI
<i>Lavendula stoechas</i>	Spanish lavender	AG, AI
<i>Lawsonia intermis</i>	Henna	AG, AI
<i>Leidum sativum</i>	Garden cress	AG, AI
<i>Lens culinaris</i>	Lentil	AI
<i>Lignum vite</i>	Grape tree	AG, AI
<i>Lilium candidum</i>	Iris	AG, AI
<i>Malus orientalis</i>	Apple	AG, AI
<i>Marrubium vulgare</i>	Marrubium	AG
<i>Matricaria Spp.</i>	Camomile	AG, AI
<i>Meliloto officinalis</i>	Field melilot	AG, AI
<i>Mentha piperata</i>	Pepper mint	AG, AI
<i>Mentha pulegium</i>	Penny royal	AG, AI
<i>Morus alba</i>	White mulberry	AG, AI
<i>Myristica fragrans</i>	Nutmeg	AI
<i>Myrtus communis</i>	Myrtle	AG, AI
<i>Narcissus pseudonarcissus</i>	Lent lily	AG, AI
<i>Nerium oleander</i>	Rosebay	AI
<i>Nigella sativa</i>	Black cumin	AG, AI
<i>Ocimum basilicum</i>	Basil	AG, AI
<i>Olea europaea</i>	Olive	AG, AI
<i>Oleum lilia</i>	Lilies oil	AI
<i>Onosma echinoides</i>	Hairy onosam	AG
<i>Opopanax gummi</i>	Opopanax Gum	AG
<i>Orchis maculata</i>	Spotted orchis	AG
<i>Origanum majorana</i>	Marjoram	AG, AI
<i>Origanum vulgare</i>	Wild marjoram	AG, AI

<i>Oxalis crenata</i>	Sorrel	AG, AI
<i>Paeonia officinalis</i>	Common peony	AG, AI
<i>Papaver somniferum</i>	Opium poppy	AG, AI
<i>Papavero rosolaccio</i>	Red poppy	AG, AI
<i>Parce carduus</i>	Thistle	AG, AI
<i>Pastinaca sativa</i>	Pastinace	AG, AI
<i>Phonix dactylifera</i>	Date	AG, AI
<i>Pinus grana</i>	Pine seeds	AG, AI
<i>Pinus nuces</i>	Pine cone	AG
<i>Pinus silvestris</i>	Pine	AG
<i>Pinus sylvestris</i>	Scots pine	AG, AI
<i>Piper nigrum</i>	Black pepper	AG, AI
<i>Pistacia vera</i>	Pistachio	AG
<i>Plantago major</i>	Way-bread	AG, AI
<i>Platanus orientale</i>	Oriental plane	AG, AI
<i>Polygonum amphibium</i>	Water knotweed	AG, AI
<i>Polypodium vulgare</i>	Adders-fern	AG, AI
<i>Populiferve</i>	Poplar	AG, AI
<i>Portulaca oleracea</i>	Common purslane	AG, AI
<i>Pruntus domestica</i>	Plum	AG, AI
<i>Pterocarpus santalinus</i>	Sandal wood	AG, AI
<i>Punica granatum</i>	Pomegranate	AG
<i>Raphanus sativus</i>	Radish	AG, AI
<i>Recinus</i>	Castrol oil	AI
<i>Rhabarber rhaponticum</i>	Rheum	AG, AI
<i>Rhus coriaria</i>	Sicilian sumac	AG, AI
<i>Rosa gallica</i>	Red rose	AG, AI
<i>Rosam</i>	Rose oil	AG, AI
<i>Rubus section</i>	Bramble	AI
<i>Saccharum officinalis</i>	Sugar cane	AG, AI
<i>Salix</i>	Willow	AG, AI
<i>Seasam indicum</i>	Sesame	AG
<i>Semecarpod oriente</i>	Marsh nut	AG, AI
<i>Sesamum indicum</i>	Sesame	AG, AI
<i>Styrax officinalis</i>	Styrax tree	AG, AI
<i>Sulfur</i>	Sulfur	AG, AI
<i>Tamarindus indica</i>	Tamarind	AI
<i>Tamarix gallica</i>	Tamarisk	AG
<i>Taraxacum officinale</i>	Dandelion	AG, AI
<i>Taxus baccate</i>	Yew tree	AI
<i>Tragopogon pratensis</i>	Meadow salsify	AG, AI
<i>Trigonella foenum-graecum</i>	Alhova	AG, AI
<i>Tropaeolum majus</i>	Monks' cress	AG, AI
<i>Urtica dioica</i>	Nettle	AG, AI
<i>Valeriana officinalis</i>	Valerian	AG, AI
<i>Verbascum thapsiforme</i>	Mullein	AG, AI
<i>Vicia sativa</i>	Tare	AG

<i>Vinegar</i>	-	AG, AI
<i>Viola odorata</i>	Sweet violet	AG, AI
<i>Vitex agnus-castus</i>	Chasteberry	AG
<i>Vitis vinifera</i>	Grape vine	AG
<i>Zingiber officinale</i>	Ginger	AG, AI

Table 13. Medicinal plants for the treatment of bloating on the basis of Avicenna's book (Naseri *et al.*, 2016)

Scientific name	Mechanism of action
<i>Cuscuta epithymum</i> L.	Detergent, phlegmagogue, melanagogue
<i>Artemisia absinthium</i> L.	Astringent, cholagogue, melanagogue, stomachic
<i>Pimpinella anisum</i> L.	Resolvent, carminative, astringent
<i>Myristica fragrans</i> houtt.	Stomachic, digestive, desiccant
<i>Aegle marmelos</i> (L) Correa	Astringent, stomachic
<i>Cuminum cyminum</i> L.	Heat producing, desiccant, resolvent, astringent
<i>Bunium persicum</i> (Boiss.) B Fedtsch	Astringent, heat producing, digestive, resolvent
<i>Cinnamomum verum</i> J Presl	Heat producing, stomachic, desiccant
<i>Piper nigrum</i> L.	Digestive, resolvent, detergent
<i>Piper longum</i> L.	Stomachic, digestive, resolvent
<i>Mentha longifolia</i> L.	Resolvent, detergent
<i>Raphanus raphanistrum</i> subsp sativus (L.) Domin	Resolvent, digestive
<i>Ziziphora clinopodioides</i> Lam.	Heat producing, stomachic, resolvent
<i>Asparagus officinalis</i> L.	Detergent, resolvent
<i>Apium graveolens</i> L.	Resolvent, heat producing
<i>Ferulago angulata</i> (Schltdl) Boiss	Stomachic, resolvent, digestive
<i>Alpinia officinarum</i> Hance	Resolvent, digestive
<i>Salvia macrosiphon</i> Boiss	Resolvent, stomachic
<i>Pistacia lenticus</i> Desf	Astringent, heat producing, stomachic
<i>Commiphora myrrha</i> (Nees) Engl.	Resolvent, laxative, stomachic
<i>Mentha spicata</i> L.	Heat producing, astringent, digestive
<i>Trachyspermum ammi</i> (L.) Sprague	Stomachic, heat producing, laxative, digestive
<i>Rosa canina</i> L.	Stomachic, central nervous system tonic
<i>Juniperus oxycedrus</i> L.	Heat producing resolvent, astringent
<i>Aquilaria agallocha</i> Roxb.	Carminative, stomachic, desiccant
<i>Foeniculum vulgare</i> Mill	Stomachic, resolvent, astringent
<i>Inula helenium</i> L.	Heat producing, detergent
<i>Ocimum basilicum</i> L.	Stomachic, resolvent
<i>Cinnamomum cassia</i> (L.) J Presl	Resolvent, astringent
<i>Glycyrrhiza glabra</i> L.	Purgative, calmative, resolvent
<i>Nigella sativa</i> L.	Digestive, resolvent, heat producing
<i>Ferula assafoetida</i> L.	Carminative, resolvent
<i>Piper betle</i> L.	Stomachic, digestive
<i>Acorus calamus</i> L.	Resolvent, detergent, desiccant
<i>Zingiber officinale</i> Roscoe	Heat producing, stomachic, resolvent laxative, digestive
<i>Taxus baccata</i> L.	Heat producing, astringent, resolvent
<i>Petroselinum crispum</i> (Mill.) Fuss	Heat producing, resolvent, digestive
<i>Curcuma zedoaria</i> (Christm.) Roscoe	Heat producing, resolvent, central nervous system tonic,

Abu Bakr Muhammad ibn Zakariya Rhazes

Abu Bakr Muhammad bin Zakariya al-Razi (865-925 AD) was born in Ray near Tehran, Iran. Rhazes was a great Persian alchemist, musician, mathematician, philosopher and physician. His masterpieces were *Al-Kitab al Hawi* (Continens Liber), a 23-volume set of medical textbooks; *Doubts about Galen*; his monograph *The Diseases of Children*; *Mental Health*, and as a skillful surgeon, he also introduced new instruments in surgical sutures (Tsoucalas *et al.*, 2019). His booklet on the ailments of children and their care contains following chapters, Dermal lesions of children; Scabies; Enlargement of the head; Abdominal distension; Sneezing; Sleeplessness; Epilepsy; Certain affliction which is known as *Mater Puerorum*; Saneous matter from the ears; Venum running from the ear; Diseases of the eyes; Obliquity of vision; Diseases of the teeth; Constipation; Cough; Pruritus and vesicles; Worms; Distension or Prominence of the umbilicus; Hernia; Stone in the bladder and Paralysis of children (Modanlou, 2015). He was appointed as the chief of the main hospital in Baghdad and for a while as a court physician (Modanlou, 2008; Rikhtegar and Zarrintan, 2014). Rhazes followed Hippocrates and Galen in his works (Compier, 2012), although, he was a follower of the Galenic thought but rejected some of his thoughts (Alvarez Millan 1999, Tubbs *et al.* 2007, Zarrintan *et al.* 2013), and he was followed by Avicenna. Rhazes authored *Kitab al-Mansuri* (Liber Al-Mansuri), a ten-volume medical encyclopedia which covers a large number of medical subjects. He gave the first accurate descriptions of smallpox and measles, advised proper food in preference to drugs in treatment, and recommended simple rather than complex remedies (Modanlou, 2008). As a pioneer of applied neuroanatomy, Rhazes used the differential diagnosis approach for the evaluation of his patients (Tan, 2002; Souayah and Greenstein, 2005), and noted that different diseases might have similar signs and symptoms (Tubus *et al.*, 2007). Rhazes described heart valves, coronary arteries and circle of willis (Mahmoudi Nezhad and Dalfardi, 2014). He recognized the heart as an organ composed of two left and right ventricles and two prominent appendices, influenced by the theory of Galen, Rhazes believed in the presence of pores within the inter-ventricular septum (Gowda *et al.*, 2006). The most important books and articles of Rhazes on medicine are shown in Table 14. Reported findings and suggestion of Rhazes for different diseases are stated in Table 15.

Table 14. The most important books and articles of Rhazes on medicine

Book	Key points	Reference
The Virtuous Life (al-Hawi)	a. One of the most prominent of his books was the nine-volume encyclopedia which is known as The Large Comprehensive or Continens Liber (Jameh-al-Kabir) in Europe.	Amr and Tbakhi (2007)
	b. The Virtuous Life contains considerations in various medical subjects and also criticisms on Greek and Aristotelian concepts.	Tubbs <i>et al.</i> (2007)
Liber and Almansoris	a. A short general textbook on medicine in ten chapters which he dedicated to the Samanid prince.	Zarrintan <i>et al.</i> (2018)
For one without a doctor (Man la Yahduru al-Tabib)	a. It was a medical advisor for the general public.	Amr and Tbakhi (2007)
	b. The book dedicated to the poor, travelers and normal citizens when a doctor was not available. This book is also known as Tibb al-Fuqara which means Medicine for the Poor.	Tayarani-Najaran <i>et al.</i> (2014) Zarrintan <i>et al.</i> (2018)
	c. The book consisted of common symptoms and some of the illnesses such as headache, colds, coughing, and melancholy and diseases of the	Meri (2006)

	eye, ear and stomach; diets and drugs components were described for these situations.	
Doubts about Galen (Shukuk ala Alinusor)	a. Rhazes rejected several claims of Greek physicians and reported that Galen's descriptions did not agree with his own clinical observations in numerous aspects.	Amr and Tbakhi (2007) Tubbs <i>et al.</i> (2007) Zarrintan <i>et al.</i> (2013)
The Diseases of Children		Zarrintan <i>et al.</i> (2018)
Proving the Science of Medicine (Isbat-e-Elm-e-Pezeshki)		Zarrintan <i>et al.</i> (2018)
Outcome of the Science of Medicine (Daramad-I Bar Elm-e Pezeshki)		Zarrintan <i>et al.</i> (2018)
The book on formation of small stones: Stones in the Kidney and bladder (Ketar-dar Padid Amadan-e-Sangrizeh)		Zarrintan <i>et al.</i> (2018)
The book on Pain in Intestine (Ketar-dar Dard-e-Roudeha)		Zarrintan <i>et al.</i> (2018)
About the Liver (Dar Hey ateh Kabad)		Zarrintan <i>et al.</i> (2018)
About the Heart (Dar Heyateh Ghalb)		Zarrintan <i>et al.</i> (2018)
A treatise on smallpox and measles (al-Judari wa al-Hasbah)		Zarrintan <i>et al.</i> (2018)

Table 15. Reported findings and suggestions of Rhazes for different diseases

Diseases	Key points	Reference
Cancer	a. Rhazes found that cancer occurs in every part of the body, with breast to be the most common localization. In the place that malignancy grew, the surrounding tissues were influenced and the veins were becoming distended, containing dark phlegma.	Tsoucalas <i>et al.</i> (2019)
	b. He categorized diseases according to the fluids in excess found in the body, and the dark phlegm could be relieved if the surgeon squeezed out the vessels during the excision of the tumor.	Tabatabaei and Tabatabaei (2014)
	c. Rhazes believed that the dysfunction of the liver and spleen could provoke an abnormal production of harmful substances in the body and alongside with some food products, they were main reasons for a malignancy to appear.	Tsoucalas <i>et al.</i> (2019)
	d. He believed that cancer was impossible to be recognized at its early stages, when it has the size of a fava bean, is movable and presents no adhesion. But, in later stages, the mass was growing, becoming immovable, ulcerated, and congested vessels appeared, surrounding the afflicted organ, giving sometimes metastasis.	Tabatabaei and Tabatabaei (2014)
	e. He believed that purging of harmful humors by venesection and purgative drugs could have been curative, but he has also suggested bloodletting as a preventive measure, sustaining that blood contained the causative material of cancer.	Tsoucalas <i>et al.</i> (2019)
	f. He mentioned that physicians should not be blamed in the case that a patient could not be cured, as cancer was almost an untreatable condition.	Tabatabaei and Tabatabaei (2014) Hajdu (2016)
Facial paralysis	a. Laghwa or facial palsy: these diseases which occurs suddenly and half of the face has flaccid paralysis and distorts and deviates to the opposite side.	Tabatabaei <i>et al.</i> (2011)
	b. some treatments include: there are some medications that could be used	Tabatabaei <i>et al.</i>

	for these patients; the supportive measures are: a) Patient should rest in a dark and warm place. In winter, patients should avoid cold and wind, b) Application of warm and dry cloth on jaw and cervical vertebra is useful and excessive use of this is advised, c) The affected side should be wrapped and pulled to other side, the skin of frontal area should be pulled down and with some warm oils should be massaged and every hour the status of the lip should be assessed and kept in the correction position.	(2011)
Gout	a. Rhazes suggested the following methods: abstinence from restricted diet, compliance with fluid and dietary regimens regarding the emphasis on certain food types and drinks, administration of laxatives, stimulations of emesis, bloodletting, application of water to the feet, treatment with salves and poultices, steam baths, taking preventive measures to avoid recurrence of gouty attacks, prompt management of incipient gout using counter-acting drugs and analgesics.	Ashtiyani <i>et al.</i> (2012)
	b. Rhazes states that Gouty patients should forsake camels meat, beef, namaksud (salted jerked meat), as well as died game meat and all kinds of jerked meat. He carefully elaborated on the role of temperature and duration of hydrotherapy in treatment of gout and reduction of pain associated with it.	Ashtiyani <i>et al.</i> (2012)
	c. He views soregan as one of the useful drugs, which helps expel cold type of sputum, he believed that other warm drugs were not such an effect like soregan.	Ashtiyani <i>et al.</i> (2012)
Head injuries	a. He underlined removing bone fragments in depressed and separated fractures of cranium along with protection of the dura.	Aciduman <i>et al.</i> (2014)
Kidney and bladder calculi disease	a. His explanations about formation, diagnosis, and treatment of calculi do not basically differ from that of modern concepts; differential diagnoses between colitis and renal colic and between kidney and bladder calculi were clearly made. b. He presented a very exact and precise description of neuropathic bladder followed by vertebral fracture, and he advanced urine analysis and studied function and diseases of the kidneys.	Ashtiyani and Cyrus (2010)
Nocturnal enuresis	a. The views of Rhazes about some of the causes of bedwetting children are: 1) relaxation of the muscles located around the bladder outlet, 2) deep sleep, 3) the mode of stimulation in the urine, 4) large and heavy food intake before bedtime, 5) excessive fluid intake before bedtime, 6) weakness of bladder in holding the urine, 7) a dislocation in the lumbar spine, 8) excessive cold or hot temperature, 9) decreased sensitivity to bladder fullness in sleep.	Ashtiyani <i>et al.</i> (2013)
	b. Rhazes described treatment protocols as followed: 1) Refraining from taking any liquids at night, 2) Minimizing the amount of food consumed for dinner, 3) Consuming substances that cause loss of body fluids and substances that can cause urinary retention, 4) avoiding heavy sleep, 5) prescription of appropriate medications and certain foods, 6) In refractory cases injecting certain drugs through the urethra into the bladder, 7) Providing special training for conditional learning in patient using psychological approach.	Ashtiyani <i>et al.</i> (2013)
Pediatric neurological diseases and pediatric neurosurgery	a. He described diagnosis of night terrors, or hyperpyretic convulsions, or a slight form of epilepsy.	Kottek (1981) Amr and Tbakhi (2007)
	b. He did not introduce novel concepts of hydrocephalus, he endeavored to improve treatment and knowledge of this condition.	Aciduman and Belen (2009)

	c. He underlined removing bone fragments in depressed and separated fractures of the cranium along with the protection of the dura.	Aciduman <i>et al.</i> (2014)
Smallpox and measles	a. He was the first physician in the history of medicine to differentiate between smallpox and measles and consider them as two separate diseases.	Kaadan (2000)
	b. He recognized the relationship between the type of the eruption in measles and the severity of the disease. He believed that food has an important function in the treatment of diseases.	Kaadan (2000)
	c. Rhazes prepared Al-Jodani Wa Hasbah, the first treatise ever written on smallpox and measles for diagnostic differentiation between these two infections, which is the basis for new medicine to diagnose and treat smallpox and measles, according to his experience of patients in hospital.	Ashtiyani and Amoozandeh (2010)

Chinese Scholars

Bian Que

Living during the time of the Zhou dynasty, between 310-407 BCE, Bian Que (Originally named Qin Yueren) is one of the most well-known medical man and physician in ancient China (Yuqun, 1988). On the basis of Records of the Grand Historian, a history book of the Chinese Western Han Dynasty, he was born in Zheng of Bohai Commander, which was located in Cangzhou city, Hebei Province, China. He founded four diagnostic methods, namely, examination, listening, study of smells, questioning and palpation. His pulse wave diagnostic feature is according to a unique diagnostic approach of traditional Chinese medicine, the examination of twelve meridians: a method to choose an emerging or relatively emerging pulsating vessel which is exemplifying or easy to inspect, among the twelve meridians and his exclusive pulse examination of the inch opening (wrist pulse). Bian Que attached particular importance to the changes in the pulse during a day or a year and he proposed the principle of yin-yang pulse examination; he emphasized the regular patterns of temporal changes in three yin pulses and three yang pulses and also observed the correlation between body types and pulses (Wang *et al.*, 2012). He is the foundation of traditional Chinese medicine and carried forwards acupuncture and moxibustion, a kind of magical skill which could bring the dead back to life (Zhan 2009). He is attributed with writing the book *Bian Que Neijing*, the Internal Classic of Bian Que, which had important influence on the development of Chinese medical science.

Table 16. Four diagnostic methods of traditional Chinese medicine

Method	Key point
Inspection	Observing the patient with eyes.
Smelling and listening	Smelling with nose and listening with ears.
Inquiry	Asks the patient or the patient's family about.
Palpation	One is feeling the impulse.

Hua Tuo

Hua Tuo was born in Qiao county of the Pei state, near Bozhou city, Anhui, and Yongzheng, Henan. Hua Tuo also achieved something in terms of health preservation with Chinese medicine and he invented a sort of Qigong movement pattern, the five-animal exercise (Balaneskovic, 2018). He has been called the miracle working doctor because of his emphasis on using a small number of acupuncture points or small number of herbs in a prescription to attain good results. He was versed in Confucian classics and was a master of ways to good health and particularly skilled in Chinese medicine, acupuncture and surgeries. He scraped the bones to rid of poisons and used *Mafeisan* as anesthetic in surgeries, an herbal anesthetic formulation made from hemp. He practiced medicine in many places including Anhui, Jiangsu, Shandong and Henan provinces where he won great fame (Huang and Liang, 2017). Zhao *et al.* (2018) also reported that Hua Tuo invented and used

Mafeisan as a general anesthetic 1800 year ago, and *Mafeisan* was used for surgery in ancient China. He is accredited for spearheading the practice of laparotomies and organ transplants, using anesthetics and he was also the first Chinese surgeon to operate on the abdomen including performing splenectomy and colostomy; moreover, he is said to have performed procedures to treat headache, paralysis, and suspected a brain tumor in one patient (Tubbs *et al.*, 2017).

Zhang Zhongjing

Zhang Zhongjing, Chinese physician who wrote titled *Shang han za bing lun* (*Treatise on Febrile and Other Diseases*), which has tremendous impacts on traditional Chinese medicine. He is also known as Zhang Ji was born in the Nanyang commandery (in modern Henan). He is also famous as the Chinese Hippocrates, his original work was divided into two books, *Shang han za bing lun* (*Treatise on Febrile Diseases*) and *Jin gui yao lue* (*Jingui Collection of Prescriptions*). This edition of the work has been lost and the published edition in the Song dynasty (960-1279 AD) is currently used (Can and Cheng, 2012). He has been best known one of the most famous practitioners in the Chinese civilization history and many physicians in Japan, Korea, America and Europe have been following his works which are regarded as canons (Li *et al.*, 2015). The *Shang Han Za Bing Lun* was composed of two sections with sixteen volumes: ten discussed diseases from external invasion of Wind and six discussed general diseases. It contains more than 200 formulae which was selected for knowledge mining based on its antiviral activity (Yu *et al.*, 2019). *The Jin Gui Yao Lue* has mentioned 40 different diseases and 255 herbal formulae; and both acupuncture and moxibustion are also mentioned. His work was revered in the East for as long as a time as Greek physician Galen of Pergamum's works were popular in the West. His *Treatise* was an important book on dietetics and influential for its information of typhoid and other fevers. He paid close attention to the physical signs, symptoms, kind and course of a disease which was carefully obtained from ay drugs that he prescribed (Balack, 2007). Kawamoto *et al.* (2020) reported that Zhang Zhongjing developed decoctions that abstract the essence from crude drugs by adding water and recognized that decoctions were more effective than pills and powders, the main medication in earlier times. His formula classics, *Shanghan lun* and *Jingui yaolue*, introduced *Honglangua jiu* (Carthamus Wine) for gynecological disorders involving stagnating blood, and *Gualou xiebai baijiu tang* (Trichosanthes, Bakeri, and Rice Wine Combination) for heart diseases. Zhao and Miao (2017) concluded that topical medicine not only in the clinical treatment effect is good, and to inherit and develop Zhang Zhongjing thought of medicine, medical practice, law, strengthen Zhong Jing prescription and medicine to enrich TCM clinical diagnosis and treatment methods to improve the clinical efficacy of traditional Chinese medicine which may provide high standards of service for patients. His theory using the overall concept of the six diseases of the syndrome differentiation, the human body organs meridians, health and blood of the corresponding organs and organs of the meridian of the site of organic combination, including the six diseases, including the relationship between the law (Zhao and Miao, 2017). Contents of the text of *The Jin Gui Yao Lue* is shown in Table 17.

Table 17. Contents of the text of *The Jin Gui Yao Lue*

Book chapter	Key point
Chapter 1	It deals with the principle of treatment, pathology and diagnosis
Chapters 2-17	They deal with a wide range of internal diseases of the Zang Fu such as consumption, breathlessness, phlegm, vomiting, diarrhea, abdominal pain, constipation, anxiety, chest pain, jaundice, stroke and malaria
Chapter 18	It discusses external diseases such as sores and abscesses
Chapter 19	It discusses miscellaneous diseases including worm diseases
Chapters 20-22	They deal with gynecological diseases
Chapters 23-25	They deal with miscellaneous remedies, food contraindications and first aid methods. These three chapters are not considered to be the work of Zhang Zhong Jing

Ge Hong

Ge Hong was born in a prestigious family of the Eastern Jin Dynasty and he is the originator of First Aid in traditional Chinese medicine. He was also an eclectic philosopher who dedicated his life to searching for physical immortality, which he thought was attainable through alchemy. His strong emphasis on morality led him to systematize and quantify earlier ideas about how spirits punished immoral behavior. He is known primarily for his interest in Daoist pursuits, but he was also a military officer, who had practiced several weapons styles and who provides valuable insights into Chinese martial arts practices (Henning, 2007). He also attempted to reconcile Daoism with Confucianism by both emphasizing the importance and naturalness of hierarchy and attacking Daoism's equalitarian tendencies. As he was known as the Chinese alchemist, he tried to combine Confucian ethics with the occult doctrines of Daoism. Ge was a prolific writer, but most of his books are lost, after widely collection of predecessors' medical formulas, folk and secret recipes, he eventually wrote *Jin Gui Yao Fang* (*Prescription of Golden Chamber*), a large-scale medical book with 100 volumes (Li and Liang, 2016). In consideration of easy reading and carrying, on the basis of the book he compiled a new book shown as *Zhou Hou Jiu Zu Fang* (*A Handbook of Formulas for Emergencies*), which is a medical book dealing with emergencies and most of the medicinal herbs listed in it are those easily to get in countryside (Zhen *et al.*, 2013). His book *A Handbook of Formulas for Emergencies* is regarded as the great achievement in traditional Chinese medicine (Li and Liang, 2016). His medical writings have played a relatively crucial role in enriching acupuncture-moxibustion theory and increasing the development of acupuncture-moxibustion technique (Yong *et al.*, 2013).

Sun Simiao

Sun Simiao was an outstanding Chinese physician scholar and author who lived during the Tang Dynasty. He is famous as King of Medicine and founded Chinese gynecology, pediatrics and geriatrics as individual healing modalities. He was a celebrated Taoist, was even regarded as a God by later generations. In 659, he compiled the world's first national pharmacopoeia *Xinxu Bencao* (*Newly Revised Materia Medica of the Tang Dynasty*). Sun Simiao also valued sanitation, exercise and disease prevention. He completed his first masterpiece of *Qianjin Yaofang* (*Essential Prescriptions Worth a Thousand Pieces of Gold*) at the age of 70, and his second master piece *Qianjin Yifang* (*Additions to the Prescriptions Worth a Thousand Pieces of Gold*) at the age of 100, and both books contain more than 6500 prescriptions. He did pay special attention to women and children's care in his books, and in pharmacology, he collected many empiric methods, used for processing, classifying and storing of drugs. *Qianjin Yaofang* was not merely a collection of formulas, but a treatise on medical practice that reviewed the work since the Han Dynasty, starting with the concepts of the *Neijing* (ca. 100 BC), which included treatise on acupuncture, moxibustion, massage, diet and exercises. Food is able to expel evil and stabilize the viscera and bowels, and to please the spirit and clear the will, thereby protecting blood and qi; to secure the body at the root, you may provide it with food and a person who does not know the appropriateness of food is unable to preserve life (Wilms, 2010). He wrote on the positive and negative aspects of foods; their benefits and harms and he preached the primary importance of a proper diet (Tan 2002). He advocated putting prevention of diseases at the first place, stressed the importance of restraining the desire to cultivate mental poise, caution in speech, and moderate in eating, which can serve as good reference for the present-day gerontology and gerontotherapeutics. In terms of medical ethics, he summarized as follows: a) it is the duty of physicians to heal the wounded and rescue the dying, and relieve their suffering, no matter how rich and how poor they are, patients are treated equally, b) never be afraid of difficulties and danger and wholeheartedly rescue patients, c) never disgust for filth and stench in the treatment of patients, d) give careful and accurate diagnosis, keep calm and pay attention to the safety of patients, e) show great respect for peers and never be jealous of others (Li and Liang, 2015).

Li Shizhen

Li Shizhen, a famous Chinese scholar of the Ming Dynasty who compiled a highly influential material medica, the *Bencao gangmu* (*Compendium of Materia Medica*), which described 1892 drugs and presented directions for preparing some 11,000 prescriptions. Because of his book which consists of 1892 kinds of medicines, he is also called the sage of herbal medicine. In clinical practice, he found that there were many problems in the ancient classics of material medica, e.g., muddled classification of medicinal, varying in illustrations and texts (Li and Liang, 2015). *Bencao gangmu*'s information derived primarily from three sources: the books *History and Development of Traditional Chinese Medicine*, *Medicine in China: History of Pharmaceutica*, and the article *China's greatest naturalist*. The book contained descriptions of 1094 herbs and 444 animal and 275 mineral substances. The text is highly detailed and organized, and it is the product of decades of study of rare books and medical texts. He was also written about pulse diagnosis called *Pinghu Maixue*. He described the uses of mercury, ephedrine, chaulmoogra oil, iodine, and even smallpox inoculation.

Conclusions

Avicenna revised the knowledge of the ancient scholars through critical thinking and relying on observation and testing, systematized the science of medicine and introduced many ideas and innovations. His famous book was *Kolliat*, which was the first book concerned with medical principles and general anatomy, *Mofradat*, the second book which is a reference for material medica, the third book which contained organ-specific diseases, the fourth book which discussed systematic illness and traumatic injuries, *Qarabadin*, his fifth book which contained descriptions of compound drugs, *Qanun* (Canon), which reviewed all medical knowledge studied by the ancient Greek and Muslim scientists. Six essential lifestyle factors which were explained by Avicenna were air, physical activity, sleep and wakefulness, psychic movement and response, food and waters, depletion and retention. Avicenna has important treatments for diseases such as ascites, atherosclerosis, belching disorder, blister disease, bloating, cancer, cataracts, cardiac tamponade, cardiology, carotid hypersensitivity syndrome, depression, hemorrhoidectomy discomforts, intestinal obstruction, wry mouth, liver and spleen illnesses, nausea and vomiting, optimal fluid intake, pain and neurology, periconceptional care, pseudocystitis, rabies, renal atrophy disease, spinal traumas, stroke, traumatic injuries and wound healing. Avicenna has introduced many medicinal plants and herbs but the most important were *Apium graveolens* L., *Asparagus officinalis* L., *Cannabis sativa* L., *Citrullus colocynthis* L., *Cydronia oblonga* Mill., *Ferula assafoetida* L., *Juglans regia* L., *Pyrus malus* L., *Malva silvestris* L., *Melilotus officinalis* L., *Mellissa officinalis* L., *Papaver somniferum* L., *Petroselinum crispum* Mill., *Pistacia vera* L., *Punica granatum* L., *Rosa damascene* Mill., *Sesamum indicum* L., and *Trachyspermum ammi* L. Abu Bakr Muhammad bin Zakariya al-Razi was a great Persian alchemist, musician, mathematician, philosopher and physician. His masterpieces were *Al-Kitab al Hawi* (Continens Liber), a 23-volume set of medical textbooks; *Doubts about Galen*; his monograph *The Diseases of Children*; *Mental Health*, and as a skillful surgeon, he also introduced new instruments in surgical sutures. Rhazes authored *Kitab al-Mansuri* (Liber Al-Mansuri), a ten-volume medical encyclopedia which covers a large number of medical subjects. He had innovative treatments for cancer, facial paralysis, gout, head injuries, kidney and bladder calculi disease, nocturnal enuresis, pediatric neurological diseases and pediatric neurosurgery, smallpox and measles. Bian Que was one of the most famous medical man and physician in ancient China who attached particular importance to the changes in the pulse examination. He is known as the founder of traditional Chinese medicine, and his four diagnostic methods were inspection, smelling and listening, inquiry, and palpation. Hua Tuo invented a sort of Qigong movement pattern, the five-animal exercise, and he did recommend using a small number of acupuncture points or small number of herbs in a prescription to attain good results. Hua Tuo invented and used *Mafeisan* as a general anesthetic 1800 year ago, and *Mafeisan* was used for surgery in ancient China. Zhang Zhongjing, Chinese physician who wrote titled

Shang han za bing lun (*Treatise on Febrile and Other Diseases*), which has tremendous impacts on traditional Chinese medicine. He is also famous as the Chinese Hippocrates, his original work was divided into two books, *Shang han za bing lun* (*Treatise on Febrile Diseases*) and *Jin gui yao lue* (*Jingui Collection of Prescriptions*). The *Shang Han Za Bing Lun* was composed of two sections with sixteen volumes: ten discussed diseases from external invasion of Wind and six discussed general diseases. It contains more than 200 formulae which was selected for knowledge mining based on its antiviral activity. Ge Hong was an eclectic philosopher who dedicated his life to searching for physical immortality, which he thought was attainable through alchemy. His book *A Handbook of Formulas for Emergencies* is regarded as the great achievement in traditional Chinese medicine. His medical writings have played a relatively crucial role in enriching acupuncture-moxibustion theory and increasing the development of acupuncture-moxibustion technique. Sun Simiao was called the king of medicine and founded Chinese gynecology, pediatrics and geriatrics as individual healing modalities. Sun Simiao also valued sanitation, exercise and disease prevention. He completed his first masterpiece of *Qianjin Yaofang* (*Essential Prescriptions Worth a Thousand Pieces of Gold*) at the age of 70, and his second master piece *Qianjin Yifang* (*Additions to the Prescriptions Worth a Thousand Pieces of Gold*) at the age of 100, and both books contain more than 6500 prescriptions. He did pay special attention to women and children's care in his books, and in pharmacology, he collected many empiric methods, used for processing, classifying and storing of drugs. Li Shizhen, a famous Chinese scholar of the Ming Dynasty who compiled a highly influential material medica, the *Bencao gangmu* (*Compendium of Materia Medica*). In clinical practice, he found that there were many problems in the ancient classics of material medica, e.g. muddled classification of medicinal, varying in illustrations and texts (Li and Liang, 2015). Having introduced and discussed some important and famous Persian and Chinese physicians, it is recommended to survey on their rules in different majors with details in future studies to make a better connection between modern and historical medical science.

Authors' Contributions

Both authors read and approved the final manuscript.

Ethical approval (for researches involving animals or humans)

Not applicable.

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Conflict of Interests

The authors declare that there are no conflicts of interest related to this article.

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