

INTESTINAL HELMINTHS FROM THE VIEWPOINT OF TRADITIONAL PERSIAN MEDICINE
VERSUS MODERN MEDICINE

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Abstract

Background: Traditional Persian Medicine (TPM) has a history of almost 10,000 years with practice and experience aspects. The existing information and experiences of physicians such as Avicenna clearly show the vast amount of knowledge in the classification and treatment of pathogenic worms. The aim of this paper was the description of the various types of helminths along with their treatment in medieval Persia and comparing them with new medical findings.

Materials and Methods: We searched main Traditional Persian Medical and pharmacological texts about etiology, manifestation, diagnosis and treatment of worms in the human digestive system and the out come was compared with the data extracted from modern medical sources. A list of medicinal plants was also extracted from traditional pharmacological books and the anthelmintic properties of these plants were checked in Google Scholar, Scopus, PubMed and Ulrich's databases.

Results: The results show the existence of theories on pathogenicity, physiopathology, symptoms and the classification of worms in TPM. TPM philosophers have divided worms into four groups and there is not great difference between old Persian and Modern classification. The old Persian scholars have explained a treatment procedure using a list of 48 medicinal plants and the anthelmintic effect of 23 plants have been shown in modern medicine studies.

Conclusion: This study shows a more in-depth and thorough classification of pathogenic worms, their pathogenicity, symptoms and treatments in Traditional Persian Medical compared to Greek Medicine so that old Persian classification may be the base of modern taxonomy. More clinical trials are suggested for the efficacy and safety of these plants.

Keywords: Helminths, Classification, Intestinal, Traditional Medicine, Persia.

Introduction

Parasitic helminthes count as the major globally important pathogens with a significant reduction in protein production and malnutrition, causing prominent economic losses and intimidating food security. Over one billion people are estimated to be infected with helminths, mostly in developing and tropical countries (Charlier, 2014, Fitzpatrick, 2013, Keiser and Utzinger, 2008). "worm" means the emotive and evocative, which is derived from the Latin word "vermis". Medical worms in modern sciences are considered to include the following phyla and classes: Nematoda (roundworms), Platyhelminths (flat worms; Trematoda and Cestoda), Acanthocephala (thorny-headed worms) (Gibson, 1998). Helminths and their infection's etiology, clinical manifestation and treatment were considered by medieval Persian physicians and philosophers such as Abu Ali al-Hussain Ibn Abdallah Ibn Sina and Abu Bakr Mohammad Ibn Zakariya Al-Razi. Traditional Persian Medicine as a type of knowledge dates back to almost 10,000 years ago.

Traditional Persian Medicine (TPM) was raised by Persian physicians and philosophers such as Al-Akhawayni (? -983 AD), Rhazes (865-925 AD), Haly Abbas (949-982 AD), Avicenna (980-1032 AD), and Jorjani (1042-1137 AD). Avicenna's great book on medicine "The Canon of Medicine" was taught as the main medical textbooks in western universities until the 17th century AD. Rhazes changed theoretical medicine into practical medicine. His great medical encyclopedia is "the kitab al-Hawi Fi-Tibb" which is famous for "Liber Continens" in Europe.

In TPM, worms were named as "**Hayyat**", "**Dood**", "**Didan**". Helminths were presented as an important cause of diseases, especially gastrointestinal disorders. A number of recorded treatment of helminths can be found in Persian manuscripts. The aim of this paper was the identification of the various types of helminths along with their treatment in medieval Persia and then presenting a list of anthelmintic plants named in traditional medical and pharmaceutical books so that these plants will be screened in modern literature for anthelmintic effects.

Materials and Methods

In this study, first we searched TPM books or manuscripts such as Hedayatul-moteallemin fi-tibb, Qanun fi-tibb, Al-Havi, Zakhireh Kharazmshahi, Kamel-os-sana'at fi-tibb, Al-Asbab val'alamat, Tebbeakbari and Exirazam for detecting gastrointestinal helminths description including etiology, manifestation, risk factors, diagnosis and treatment. The other aim of study was comparing the signs and symptoms of helminths in TPM with modern medical science. In the second part of the study, five traditional pharmacological books were searched to find the effective medicinal plants in helminth infection treatment with the term "**Hayyat**", "**Dood**", "**Didan**", "**Habbolqara**" "**Amaa**" as listed in table 1. (Makhzan-al-Aadvia, Al-Abniyah an haqaiq al-adviyah, Tuhfatul-mumenin, Qanun fi- tebb, Al-Havi). Then each plant in the list was classified according to the number of repetitions in five traditional pharmaceutical books (Table 1). Afterwards we matched listed medicinal plant's name with scientific name (Ghahreman and Okhovvat, 2009). At last these plants were screened in modern articles by Google scholar, Scopus, PubMed and Ulrich's databases for effects with the term "worm, helminth, anthelmint, intestinal helminth".

Results

General aspects: Persian old scholar thought that gastrointestinal helminth diseases initiated with aggregation and stink of the mucus (phlegm) results from soft, viscous and thick food as uncooked meat, vegetables, fruits, fatty foods, over eating and disability of the gastrointestinal tract for digestion of the food (Avecinna, 2005, Razes, 2000, Ahvazi, 2009). According to these references, the incidence of intestinal helminths in autumn are more common than other seasons and the worms are more active at night and bed time than day. Also, presence of worms in head, ear, nose, teeth and wound is described in Iranian old references (Avecinna, 2005; Ahvazi, 2009; Al-Akhavini, 1992).

General symptoms and signs: General manifestations of gastrointestinal helminth infections are included: mouth running, wet lips at night, dryness of lips during day, sadness, irritation, screaming in sleep, tooth grinding specially at night, nausea, increase or decrease the appetite, moist stool, change the color of face and eye, cold and stink of sweat, abdomenache, hoarseness and weak pulse (Avecinna, 2005, Razes, 2000).

Classification of intestinal helminths: Avicenna (980–1037 AD) and other Persian physicians and philosophers categorized the helminths in four classes including long worms (**Hayyat**), wide worms (**Habbolqara**), round worms and tiny worms (**dood-al khal**) (Avecinna, 2005). Additionally, they mentioned that all of these worms live in a specific section of intestinal tract and have specific clinical signs and treatment methods. Also, they declared that the occurrence of infection with any of worms is more common in specific age groups but all kinds of worms maybe seen in all life time (Avecinna, 2005).

Table 1: The list of Iranian traditional medical books from 9th century to 20th century AD

Title	Author	Century produd (A.D)	subject
<i>Al-Hawi fi-tibb</i>	Razes	9	encyclopedia for practicing and teaching medicine
<i>Al-Maleki (Kamel-os-sana'at fi-teb)</i>	Ali-ibn-e Abbas MajusiAhvazi	10	Perfect Creation in Medicine
<i>Hedayatul-moteallemin fi-tibb</i>	Akhaveini Bokharaei	10	Guides for Medicine Learners
<i>Al-Abniyah an haqiq al-adviyah</i>	Abu Mansour Ali-olHeravi	10	traditional pharmaceutical book
<i>the Canon (Qanun fi-tibb)</i>	Avicenna	11	encyclopedia for practicing and teaching medicine
<i>Zakhireh Kharazmshahi</i>	Seyyed Ismaeel Jorjani	12	traditional medicine book
<i>Al-Asbabval`alamat</i>	Najeebeddin Samarqandi	12	traditional disease descriptions book
<i>Tebbeakbari</i>	Hakim Mohammad Akbar Arzani	17	traditional disease descriptions book
<i>Tuhfatul-mumenin</i>	Seyyed Mir Muhammad Mumin	17	traditional pharmaceutical book
<i>Makhzanul-adviyah</i>	Seyyed Muhammad Hoseyn Aghili Khorasani	18	traditional pharmaceutical book
<i>Exir azam</i>	Hakim Mohammad Azam Khan	18	traditional disease descriptions book

Long-worms: These kinds of worms are long, narrow and ruddy and may reach to one meter of length and the number of worms reach up to three or more in one patient. Growth and multiplication of these worms take place in small intestine (Avecinna, 2005, Azam khan, 2014).

These kinds of worms can cause cramps, mouth running, tooth grinding in bedtime, dryness of lips during day, heartburn, feel of worm movement at the time of hunger, nausea and vomiting, dysphagia, hiccups, appearing the worm in stool, mostly decrease in appetite, sometimes reddish or yellowish eye, weakness, laziness, palpitation, dry cough, sleep disorders and in some cases symptoms like epilepsy. This kind of worms are seen in childhood to teenager periods (Avecinna, 2005, Azam khan, 2014, Al-Samarghandi, 2013). Avoidance of using sweets, fatty, viscous and thick food is necessary for treatment. Fried food with hot spices are recommended food for these patients (Arzani, 2009).

Wide-worms: They are wide, white and similar to pumpkin seeds. They live in colon and cecum and lots of them lie in a membrane (Avecinna, 2005, Razes, 2000, Azam khan, 2014). They are seen after teenager periods and are more harmful than other types. Clinical symptoms and signs include increased appetite, wet lips at night, dryness of lips during day, mouth running, yellowish face, sleep disorders, tooth grinding, weakness, intermittent periumbilical pain and appearing the worm in stool (Avecinna, 2005, Arzani, 2009). Avoidance of using fatty, viscous, thick and high humidity food (as milk, fresh cheese and halim) is necessary for treatment and the use of vinegar at night is helpful. The more powerful drug is needed in comparison with long worms, because of the farthest site. Enema in these worms is more effective than long worms (Avecinna, 2005, Razes, 2000, Azam khan, 2014, Arzani, 2009).

Round-worms: These worms are round, small and white. They are similar to wide worms in perspective of cause, site, clinical manifestations and treatment. These cylindrical worms are seen mostly in teenager periods and rarely in old person (Avecinna, 2005).

Tiny-worms: These worms are small, narrow, white and similar to vinegar and cheese worms. The creation and growth site of them is in the rectum and appear permanently and more easily than other types of worms in the stool. They are the safest worm, but their long time persistence will be dangerous. Pruritus is the specific manifestation, which can be very severe and leads to faint. The accumulation of a large number of tiny worms can cause a feeling of heaviness under the ribs and the back, also inducing diarrhea. They can be cured by enema as like as core of bitter apricot's oil (Avecinna, 2005, Azam khan, 2014, Arzani, 2009).

General treatment: Persian old scholar proposed warm and dry food as like as pigeon meat for treatment and avoidance from viscous, thick and fatty food. Extracts of peas (nokhod-ab), leaves of cabbage, dried coriander, Rhus coriaria (sumac) and the use of vinegar before sleeping are effective for treatment of all kinds of worms. Applying hot temperament, bitter and vermifugal drugs in the form of oral, suppositories, enema and plaster is recommended for treatment (Avecinna, 2005, Razes, 2000, Ahvazi, 2009, Azam khan, 2014).

Complications: Fever, bleeding, obstruction, bulimia, colic and epilepsy are the most common complications of gastrointestinal helminthes (Avecinna, 2005, Razes, 2000, Ahvazi, 2009, Azam khan, 2014).

Differential diagnosis method of long worms from wide and round ones: For this purpose patient goes to the bathroom and waits for warming the body. Then puts a piece of ice or something cool on his abdomen. If the patient feel and see the bump or movement in the upper part of the umbilicus, the diagnosis will be long-worm, while the bump or movement in the lower part of the umbilicus will confirm the diagnosis of the wide or round-worm (Al-Samarghandi, 2013, Arzani, 2009).

Anthelmintic effects of plants in Traditional Persian Medicine were compared with modern medical science. Lists of plants in TPM are briefly described in table 2.

Table 2: Major anthelmintic plants used in Traditional Persian treatment vs. recent anthelmintic effects in modern medicine

Traditional name	Scientific name	Family	Nature	Q	M	T	H	A	anthelmintic effects	Study methods	Reference(s)
Tormes	Lupinus luteus L	Fabaceae	Hot &dry	*	*	*	*	*	-		
Joadah	Teucrium polium	Lamiaceae	Hot &dry	*	*	*	*	*	-		
Kornob	Brassica oleracea L	Brassicaceae	Hot &dry	*	*	*	*	*	-		
Korovia	Cuminum cyminum	Apiaceae	Hot &dry	*	*	*	*	*	-		
Mor	Commiphora myrrha Engl	Burseraceae	Hot &dry	*	*	*	*	*	-		
Kabar	Capparis spinosa	Capparaceae	Hot &dry	*	*	*	*	*	*	In vitro	Caboni P et al., (2012)
Sarakhs	Dryopteris filix -mas	Polypodiaceae	Hot &dry	*	*	*	*	*	*	In vivo	Jiang B et al., 2013,Lu C et al. 2012
Shuniz	Nigella sativa L	Ranunculaceae	Hot &dry	*	*	*	*	*	*	In vivo	Abu El Ezz NM, 2005
Berangekaboli	Embelia ribes	Primulaceae	Hot &dry	*	*	*	*	*	*	In vivo+In vitro	Hördegen P et al., 2003
Toot	Morus nigra	Moraceae	Hot & moist	*	*	*	*	*	-		
Khookh	Amygdalus persica	Rosaceae	Cold&moist	*	*	*	*	*	-		
Romman-hamez	Punica granatum L	Lythraceae	Cold&dry	*	*	*	*	*	*	In vitro	Ali N et al., 2015
Fodenj	Mentha pulegium	Lamiaceae	Hot &dry	*	*	*	*	*	*	In vitro	Caboni P et al., 2013,Maggiore MA et al., 2012 ,Ntalli NG et al., 2010
Ghardemana	Lagoecia cuminoides	Apiaceae	Hot &dry	*	*	*	*	*	-		
Qost	Costus speciosus	Costaceae	Hot &dry	*	*	*	*	*	*	In vitro	Srivastava S et al., 2011
Ghenbil	Mallotus philippinensis Muell	Euphorbiaceae	Hot &dry	*	*	*	*	*	-		

Narjil	Cocos nucifera	Arecaceae	compound	*	*	*	*	*	*	In vivo	Mehlhorn H et al., 2011, Costa C et al., 2010
Shih	Artemisia santonicum	Asteraceae	Hot &dry	*	*	*	*	*	-		
Zoofa-ieiabes	Hyssopus officinalis	lamiaceae	Hot &dry	*	*	*	*	*	-		
Oshagh	Dorema ammoniacum	Apiaceae	Hot &dry	*	*	*	*	*	-		
Soom	Allium sativum L	Liliaceae	Hot &dry	*	*	*	*	*	*	In vitro+ in vivo	Mantawy M et al., 2012, Velkers F et al., 2010
Horf	Lepidiumum sativum	Brassicaceae	Hot &dry	*	*	*	*	*	-		
Hasha	Thymus capitatus	Lamiales	Hot &dry	*	*	*	*	*	*	In vitro	Elandalousi RB et al., 2013
Mazerion	Daphne mezereum	Liliaceae	Hot &dry	*	*	*	*		-		
Hanzal	Citrullus colocynthis	Cucurbitaceae	Hot &dry		*	*	*	*	*	In vivo	Ullah S. et al., 2013
Afsantin	Artemisia absinthiuml	Asteraceae	Hot &dry	*	*	*	*		*	In vivo	Tariq K et al., 2009
Kozboreh	Coriandrum sativum	Apiaceae	compound	*	*	*	*		*	In vitro+ in vivo	Macedo ITF et al., 2013, Egualde T et al., 2007
Baghlatol-hamgha	Portulaca oleracea L	Portulacaceae	Cold&moist	*	*	*	*		-		
Kashem	Levisticum officinale	Apiaceae	Hot &dry	*	*	*	*		-		
Qaysum	Artemisia abrotanum L	Asteraceae	Hot &dry		*	*	*	*	-		
Joz	Juglans regia	Juglandaceae	Hot &dry	*	*	*	*		*	In vitro	Kale A et al., 2011
Naanaa	Menthe piperita	Lamiaceae	Hot &dry	*	*	*	*		*	In vitro+ in vivo	Romero MC et al., 2014
Hemmes	Cicer arietinum	Fabaceae	Hot &moist	*	*	*	*		*	In vitro	Kumar P et al., 2013
Saatar	Zattaria multiflora	Lamiaceae	Hot &dry	*	*	*	*		-		
Sodab	Ruta graveolens	Rutaceae	Hot &dry	*	*	*	*		-		

Aftimoon	Cuscuta epithymum	Cuscutaceae	Hot &dry	*	*	*	-		
Habbol-nil	Ipomoea hederacea	Convolvulaceae	Hot &dry	*	*	*	*	In vitro	Haq MZU et al., 2010
Qantaureion	Centaurea centaurium	Asteraceae	Hot &dry	*	*	*	-		
Abukhalsā-Shankār	Alkanna tinctoria Tausch	Boraginaceae	Hot &dry	*	*	*	-		
Zarāvandtavil	Aristolochia longa L	Aristolochiaceae	Hot &dry	*	*	*	-		
Soád	Cyperus longus L	Cyperaceae	Hot &dry	*	*	*	-		
Nammam	Mentha aquatica	Lamiaceae	Hot &dry	*	*	*	-		
Ajjas	Prunus domestica	Rosaceae	Cold &moist	*	*	*	-		
khardel	Brassica nigra	Brassicaceae	Hot &dry	*	*	*	*	in vitro	Basha SN et al., 2011
Sepestan	Cordia myxa	Boraginaceae	Moderate & moist	*	*	*	*	In vitro	Hussain N, 2013
Saghmoonnia	Convolvulus scammonia	Convolvulaceae	Hot &dry	*	*	*	-		
Sagbinaj	Ferula persica	Apiaceae	Hot &dry	*	*	*	*	<i>In vitro</i>	KAKAR SA et al., 2013
Komoun	Cuminum cyminum	Apiaceae	Hot &dry	*	*	*	*	In vitro	Kumar S et al., 2012

Al-Hawi fi-tibb (H) Al-Abniyahanhaqaiq al-adviyah (A), the Canon (Q), Tuhfatul-Mumenin (T), Makhzanul-Adviyyah (M)

Of 48 plants that were used in treatment of helminths in 5 Traditional Medicinal and pharmacological books, 23 medicinal plants have been repeated in 5 investigated books as listed in table 2. Anthelmintic effect of 21 plants have been shown in modern medicine studies. 16 plants in order of frequency belong to the Apiaceae, Lamiaceae and Brassicaceae families.

Discussion

The Traditional Persian Medicine (TPM) philosophers and physicians like Avicenna provided a thorough description of the clinical symptoms and signs, progression, prediction and treatment of the helminth diseases. The main portion of their description shows similarities to modern medicine. Our review of the section on the classification and treatment of gastrointestinal helminths in the TPM shows that Persian philosophers and physicians had a meticulous approach to diagnosis and management for patients who suffered from gastrointestinal helminths.

The Greek and Roman philosophers (before and around the time of Christ) recognized two or three worms responsible for human infections (Kaufmann and Steward, 2005). All these helminths were easily recognized because most of them were big and settled in the gastrointestinal tract. Celsius (c.30 BC-38 AD) and Pliny (23-79 AD) divided the worms in two classes of tapeworms and roundworms (Anderson and Bemrick, 1965, Anderson, 1978) while Hippocrates (c.460-374 BC), Aristotle (384-c.322 BC) and Galen (129-c.200 AD) were familiar with tapeworms, round worms and thread worms (Baylis et al., 1925, Africa CM and Garcia EY, 1936, Bancroft TL, 1904).

Persian old scholar divided the helminth in four classes of long, wide, round and tiny worms. In modern categorization helminthes are invertebrates characterized by elongated, flat or round bodies and divided into three classes including flukes (trematodes), tapeworms (cestodes) and roundworms (nematodes). There is not great difference between Persian old and modern classification and this classification may be the base of modern taxonomy.

Treatment of diseases began a long time ago with the consumption of herbs. Plants have an extended history of use in both modern and traditional medicine and are the bases of imperative drugs such as atropine, codeine, digoxin, morphine, quinine, vincristine and furthermore these medications may have less side effects and better treatment compliance (Farajpour R et al., 2017). Researches have summarized some medicinal plants that used as antihelminth in Persian old medicines (Golshani SA, 2015). Some of these plants are used in modern medicines and others are poorly known. This study showed that *Capparis spinosa*, *Dryopteris filix-mas*, *Nigella sativa L*, *Embelia ribes*, *Punica granatum L*, *Mentha pulegium*, *Costus speciosus*, *Cocos nucifera*, *Allium sativum L*, *Thymus capitatus*, *Citrullus colocynthis*, *Artemisia absinthium L*, *Coriandrum sativum*, *Juglans regia*, *Menthe piperita*, *Cicer arietinum*, *Ipomoea hederacea*, *Brassica nigra*, *Cordia myxa*, *Ferula persica* and *Cuminum cyminum* have anthelmintic effects in modern medicine. Modern studies should be focused on the effectiveness and safety of untested traditional medicinal treatment to encourage general population to use these natural remedies for the promotion of the public health. Correspondingly, there is a strong need to undertake phytochemical examination of these plants in future studies.

Conclusion

The present study summarized a more in-depth and thorough classification of pathogenic worms, thier pathogenicity, symptoms and manifestations of gastrointestinal infections, treatment and the control of such maladies by Traditional Persian Medicine versus the knowledge of Greek and Roman physicians such as Hippocrates, Aristotle, Galen so that old Persian classification may be the base of modern taxonomy. Medicinal plants which are mentioned in the Traditional Persian Medicine may be more useful in the treatment of mentioned diseases by conducting comprehensive studies on the efficacy and safety of these natural resourses. These comments might be useful for future clinical trial studies in order to increase the diagnosis and treatment of these diseases.

Conflict of Interest: The authors declare no conflict of interest in this study.

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