

ORIGINAL ARTICLE

The Concept of Porosity and Condensity in Persian Medicine

105

Abstract

Persian Medicine (PM) is a holistic medical system with a unique theoretical base and practical knowledge. Considering its different paradigm and background philosophy compared to conventional medicine, understanding its fundamental principles is necessary for more accurate and efficient clinical practice. One of its fundamental theories is the concept of “Takhalkhol (porosity) and Takasof (condensity)” which has a significant impact on medical practice. This critical issue has been investigated in recent studies to evaluate the density of the body organs as a diagnostic tool. Despite its importance, no distinct section of the leading Persian Medicine sources has been dedicated to elaborating this basic concept. In this study, we have presented this crucial concept based on PM sources and current literature to reveal its clinical relevance in the realm of its clinical relevance in diagnosis and disease management. The relation between porosity and condensity and other issues such as body composition, Mizaj (temperament), and nutrition has been discussed.

Key words: Porosity, Elasticity, Temperament, Persian Medicine, Integrative Medicine, Nutrition

Received: 24 Feb 2022; Accepted: 8 May 2022; Online published: 25 May 2022
Research on History of Medicine/ 2022 May; 11(2): 105-114.

Majid Nimrouzi^{1, 2}
Babak Daneshfard^{3, 4}
Vahid Tafazoli⁵

- 1- Ph.D., Research Center for Traditional Medicine and History of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran
- 2- Department of Persian Medicine, School of Medicine, Shiraz University of Medical Sciences, Shiraz, Iran
- 3- MD, Ph.D., Chronic Respiratory Diseases Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Shahid Beheshti University of Medical Sciences, Tehran, Iran
- 4- Persian Medicine Network (PMN), Universal Scientific Education and Research Network (USERN), Tehran, Iran
- 5- Ph.D., Essence of Parsiyan Wisdom Institute, Phytopharmaceutical Technology and Traditional Medicine Incubator, Shiraz University of Medical Sciences, Shiraz, Iran

Correspondence:
Babak Daneshfard

MD, PhD; Chronic Respiratory Diseases Research Center, National Research Institute of Tuberculosis and Lung Diseases (NRITLD), Shahid Beheshti University of Medical Sciences, Tehran, Iran

daneshfard@sbmu.ac.ir

Citation:

Nimrouzi M, Daneshfard B, Tafazoli V. The Concept of Porosity and Condensity in Persian Medicine. *Res Hist Med.* 2022; 11(2): 105-114.

Introduction

With a thousand-of-years history, Persian Medicine (PM) is one of the oldest holistic schools of medicine. This *Hikmat* (philosophy)-based medical school, also known as Unani medicine, stands on the theory of humoral medicine and temperament (Atarzadeh *et al*, 2016, pp. 367-370). In this theory, quadruple qualities of hotness, coldness, wetness, and dryness make the fundamental concept of temperament and four humors: sanguine or blood (hot and wet), yellow bile (hot and dry), phlegm (cold and wet), and black bile (cold and dry) (Nimrouzi *et al*, 2019, pp. 45-54).

Takhalkhol (porosity) and *Takasof* (condensity) are two of the basic concepts in Persian Medicine (PM). They might be considered to be modalities/conditionalities through which the state of health or otherwise of any human body could be evaluated: whether the patient is in a severe state of her disease or not [or, rather, whether she does not at all fall into a specific suspected category of disease]. Other than the four known qualities of hotness, coldness, wetness, and dryness (Kalantari *et al*, 2018, pp. 915-917), *Takasof* (condensity) and *Takhalkhol* (porosity) come in much handy for a PM practitioner when there is a question of a more elegant diagnosis and prognosis. According to ancient Persian *Hikmat* (philosophy), living and nonliving physical bodies have a certain degree of *Takasof* (condensity) or *Takhalkhol* (porosity); the knowledge of any body's texture is arrived at when one knows approximately for sure what portion of, say, hotness goes along with what portion of *Takhalkhol*, which can then be translated into a better understanding of living tissues, too—as there are other instances of portionality and proportionality amongst the six abovementioned traits, which themselves bring about other nuances in states of disease discernment.

In traditional natural philosophy, *Takhalkhol* is referred to as the state of an object's constituents dissenting away from each other, where the dimensionality of volume might tend to increase (Figure 1). On the contrary, *Takasof* spells as dimensions decrease with the most probable occurrence of constituents approaching one another (Anvari and Anvari, 2012, pp. 23-24; Arzani, 1915, p. 201).

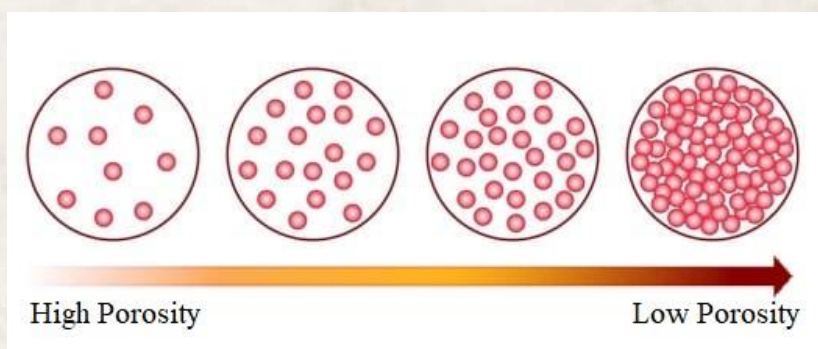


Figure 1. A schematic comparison between high and low porosity states.

Takhalkhol, though hereditary, is undoubtedly under the influence of nutritional and environmental factors, too. PM has enough literature on both the *nature* and the *nurture* of *Takhalkhol* whereby the detailed mechanism of its relation, correlation, interrelation, and [quasi-]causative effect with and upon a number of ailments comes forth.

There is scant evidence about the role of porosity in human health in literature, but the contribution of porosity as a cause of the disease is a highly mentioned issue in PM sources. This article aims to show the importance of porosity and condensation in health according



to PM, not disregarding conventional medicine's evidence and/or manner of dealing with the whole issue.

Concept of porosity and condensity in Persian Medicine

Takhalkhol (porosity) is a change or a motion in quantity; it means increasing the volume of the body or a specified organ without increasing in total mass. The growth differs with porosity as it increases both volume and mass. *Takasof* (condensation), thus, would be decreasing in the volume without change occurring in the mass. A decrease in the volume and mass of the human body is called *Zabool* in PM. It corresponds pretty well with cachexia in conventional terminology. Growth is specific to children and youth, but *Takhalkhol* and *Takasof* are not peculiar to any particular age range (Arzani, 1915, p. 201).

Condensation of an organ leads to increasing density and stiffness, whereas porosity causes laxity and increases the organ's volume. According to the theoretical basics of PM, the more condensed an organ is, the less compromised and less prone to disease. On the other hand, more porous organs are more prone to disease status. Furthermore, the people with the more condensed bodies are deemed more robust, and have more stamina and tolerance against diseases. These people, nonetheless, need more powerful medications (in higher dosage) in disease states.

Children's bodies are more porous as compared to adults. It is partly because of their need for growth and consumption of foods that are [to be] moist in *nature* or *Mizaj* (constitution or temperament). This porosity puts them at risk of dehydration if they have water and electrolyte loss because of diarrhea or similar conditions. Here comes one of the exemplary cases of the relationship between porosity and nature of the feed. When nutrition is suited to a specific age bracket, then PM is well able to, according to its own theoretics, explain the concordance between the body level of condensity and/or porosity and the condensity and/or porosity on which the body feeds. More widely speaking, PM can elucidate any parallelism between the clinical, digestive, specific-needs, convalescence, and even ergonomic occupational regimen of food and the condensity and/or porosity of anyone's body.

Mizaj, humors and porosity

Another example for shedding light on the extant relation between the constitutional structure of foods and the humors lies in the fact that the type of nutrition creates its own humor, where humor itself procreates kinds of tissues. For instance, bodies with an extra amount of phlegm are fatty, bright in complexion, and more porous. A marker is that the saliva in phlegmatic people is usually high in amount and foamy (Cheghmini, 2010, p. 63).

A discussion might as well have been opened on how two different humors as a body's particular modality could bring about characteristics and different clinical features. People with, say, a simultaneous predominance of phlegm and bile would experience instability of mood, lenity, badinage, and more porosity of their body organs (Aboozaid, 2007, p. 147).

Porosity and the body organs

It is not true that PM can only explain porosity vs condensity *ex post facto*. PM can even go to the extent of predicting the in-balance/out-of-balance level of *Takhalkhol* (Porosity) and *Takasof* (condensity) among either healthy members of the society or those epidemiologically foreshadowed to fall into the category of "illness".

The body organs differ in porosity and condensity. The classification of the body organs based on their porosity and condensity is based on the aforementioned definition of these



two items and the function of the specific organs. For example, the lung should be more porous to be competent in its main function that is inhalation and exhalation (Jorjani, 2006, p. 541). The kidneys are condensed compared to the lungs while the liver is somewhere between the lungs and the kidneys (Ibn Eshagh, 1978, p. 35). The gonads contain loose flesh: they are porous; the fontanelle (because of its lightness) and the penis belong to the porous organs category (Avicenna, 1985, p. 404). The spleen is an organ with loose and porous flesh (Razi, 2003, p. 575). Peritoneal nerves and most of the nerves of the body are considered condense according to the PM literature (Qef, 1925, p. 539).

Nutrition and porosity

According to PM, food digestion comprises four steps: the first step, occurring in the gastrointestinal (GI) tract, starts in the mouth with the effect of the saliva upon the morsel, where innate heat acts on the bit. It finally ends in the intestines (Nimrouzi and Zarshenas, 2015, pp. 1-6). The ingested food changes into chylous in the stomach and is absorbed through the mesenteric veins. The second step of digestion happens in the liver. In the liver, the four humors –i.e., phlegm, sanguine, bile, and black bile– are produced. These humors enter the blood circulation. As the third stage of digestion, vascular digestion, takes place in the blood vessels. The produce of the vascular digestion gets into the fourth stage, where membranous and/or cellular digestion takes place (Nimrouzi *et al*, 2015, p. 47). Each digestion step produces some waste that should be evacuated from the body. The waste materials of the first step are depleted as stool through the anus; the waste of the second through the bladder as urine; while the waste of the third and the fourth stages of digestion are excreted as sweat, earwax, sputum, and semen (Nimrouzi and Zarshenas, 2015, pp. 1-6). These four digestion stages are so important that any disturbance in their usual process could even lead to a severe disease such as infertility (Daneshfard and Jaladat, 2016, pp. 103-104).

The PM sages believed that every specific food would produce some specific humor that could either contribute to the porosity of the target organ or bring about even more condensity. This depends on the type and quality of the food, the manner it is cooked, broiled or steamed, or the degree to which it is possibly spiced. Other likely parameters may include what target organ it is and at what age. For example, the humor produced from broad beans leads to porosity and looseness of the flesh (Razi, 2005, p. 409). On the other hand, some special foods recommended by PM are effective in treating diseases (Ahmadi *et al*, 2020, pp. 121-125).

Porosity leads to the waste of body heat; because of energy lost this way, the appetite increases as a compensatory mechanism (Arzani, 2008, p. 201). In PM, foods are classified into hot-, cold-, and average- temperaments based on how their secondary metabolite would change the basal body heat (Nimrouzi *et al*, 2015, p. 45). The foods that produce heat are hot, and those that decrease the heat are considered cold. The average foods do not change the intrinsic heat. The hot-temperament foods usually cause the porosity of the body organs; for this reason eating cold things just after the hot ones damages the teeth (Nimrouzi *et al.*, 2015, p. 48; Hakimi, 1986, p. 1).

People with porous bodies lose their energy more rapidly than individuals with condensed bodies; they need to eat easily digested, watery, and energetic foods more frequently to keep their energy reservoir (Avicenna, 2014, p. 245).

Etiology of porosity

There are many causes of acquired porosity comprising hot weather, too much inter-



course, starvation, frequent and long-time baths, especially in a Turkish sauna, heavy exercise (Arzani, 2008, p. 201), walking in hot weather, insomnia, depression, rage, and grief (Abdollah, 2004, p. 46). Phlebotomy (*fasd*) [venesection for treatment of sanguine humor dominance] is also considered an essential cause of porosity (Halabi, 2009, p. 135; Nimrouzi et al, 2014, p. 129). Hot-tempered foods and poultice (*mosakhenat*) may cause porosity, which leads to loss of body heat and energy. If they continue for a long time, porosity-causing processes cool the body and compromise the stamina, putting the body at risk of developing diseases (Arzani, 1915, p. 201).

Sexual intercourse causes porosity by increasing intense body movements and temporarily warms the body. Besides, indulgence in sex eventually cools and weakens the body (Jaladat et al, 2013, pp. 43-47). Bathing with cold water after intercourse may jeopardize the body's health because of the imposed porosity due to intercourse and the vulnerability of the body to cold water. Flaccid paralysis and embolic stroke might develop because of a cold bath just after intercourse in susceptible individuals (Gilani, 2008, p. 50; Aghili, 2006, p. 103; Avicenna, 2014, p. 34). Turkish bath, exercise, rage, and (excessive) contemplation bring about porosity in the brain (Avicenna, 2014, p. 47).

Porosity and diseases

In general, porosity increases the risk of diseases because it makes the body organs vulnerable to external hot and cold weather; on the other hand, the porous organs are more susceptible to accumulation of morbid matters because the cellular waste cannot be evacuated quickly (Halabi, 2009, p. 135). People with porous bodies may develop constipation and a decrease in amount and volume of stool, intolerance to fasting, and intolerance to external heat (Azamkhan, 2008, p. 12), while those with condensed bodies are less susceptible to fainting or to have syncope (Avicenna, 2014, p. 47).

According to PM sages, innate heat, the main source of life, wastes in porous bodies much more easily and quickly (Avicenna, 2014, p. 48; Nimrouzi et al, 2015, p. 50). Eating disorders, hair loss, and renal failure are also considered diseases related to porosity (Abdollah, 2004, p. 46; Jorjani, 2001, p. 46; Ibn Elyas, 2004, p. 13).

Clinical manifestation of porosity

The physician's expert in PM diagnoses the porosity. History taking, physical exam, and thorough urine examination are important diagnostic tools for porosity. The skin turgor is usually loose and soft; the skin seems wet; the pulse is weak, slow and soft; and the urine is darker than , especially among children (Azamkhan, 2008, p. 12). The weak pulse is also seen in people who are used to swimming in hot water springs. It is due to the effect of hot water on body pores, namely: imposing porosity in the body might lead to the getting out of innate heat through the said pores. The porous body loses the heat easily, and the pulse would consequently become weak and slow (Azamkhan, 2010, p. 50).

Porosity and medical interventions

Changes in porosity and condensity of the body through changing diet are considered a strategy for maintaining health and treating diseases. In anorectic patients who have condensed bodies and hardened skin with compromised absorption of chylous from the mesenteric veins by the liver, the body and the skin should be made porous. Going to a Turkish bath and average exercise with sweating are the proper recommendations to this end (Avicenna, 2014, p. 46).



People with overindulgence eating usually tend to get more porous and excessive sweating. These people should have routine daily exercise and, if he is physically fit, swims in cold water (Avicenna, 2014, p. 46).

Physical activity generally causes temporarily body porosity and waste mollification in order to facilitate voiding. However, it also is a way for the treatment of the porous bodies –because the evacuation and expulsion of the waste from tissues cause the porous organs to reconsolidate and retrieve their strength and/or stamina (Azamkhan, 2008, p. 12). If the cause of bulimia is considered to be hot dystemperament resulting in porosity and emaciation, then repose, unction with myrtle oil, sit in cold water, drink lemon syrup and bergamot syrup, and eat *halim* (a food made of wheat and lamb) would be helpful (Jorjani, 2001, p. 412).

Rate-dependent massage, hard/soft thrust, and massage frequency/time period are ways to induce porosity and condensity in the body. Long, hard and intense massage induces condensity, whereas short and soft massage induces porosity (Avicenna, 2007, p. 211). It is crucial to be aware of the porosity and condensity of the patients; the prescription of potent purgatives is somewhat risky for the weak and thin people with a porous body (Avicenna, 2014, p. 212; Gallen, 2008, p. 30).

In Canon of Medicine, Avicenna (980–1037 AD) (Nimrouzi *et al*, 2016, pp. 241-244) makes mention of patients with porous bodies, excessive sweating, and hot-skin abdomen [who are skinny as well]; he passes the opinion that they should start their meals with figs, grapes, cotoneaster, and prune. They should also use fatty foods more frequently in their diets (Avicenna, 2014, p. 47). Phlebotomy (*fasd*) is not indicated in the porous bodies except when it is indispensable (Ibn Abbas, 2008, p. 341). The duration of healing for porous organs is longer than condensed ones; for this reason, wounds in the lung heal later than normal because their tissue is porous (Zahravi, 2004, p. 501).

Body composition

Recent studies support the idea that healthy body composition plays an important role in prognosis, clinical decision, and quality of life in many clinical and non-clinical situations. Body mass index (BMI) cannot precisely show the body composition, although determining body composition ratio is applicable using exclusive scanning. Lack of BMI efficacy for evaluation of body composition is partly due to body fat increase further than compensatory volume reduction of other organs keeping BMI unchanged despite body composition alteration. Determination of body composition and proportion of fat tissue to other body tissues may benefit some clinical conditions, disease states, and seniors' health evaluation (Prado and Heymsfield, 2014, pp. 940-953).

Considering body weight alteration and BMI per se may disremember some abnormalities in body composition, including osteopenia/osteoporosis, sarcopenia, fatness, and sarcopenic obesity in which muscles diminish and fat tissue increases (Ormsbee *et al*, 2014, pp. 183-192).

Sarcopenia increases the duration of hospitalization, rate of infectious and non-infectious diseases, metabolic syndrome, and overall death rate, especially in the elderly (Roubenoff and Kehayias, 1991, pp. 163-175; Cosquéric *et al*, 2006, pp. 895-901, Pichard *et al*, 2004, pp. 613-618). Along with community ageing, sarcopenic obesity shows an increasing trend, and its effect on health and physical function is a subject of ongoing research (Prado *et al*, 2014, pp. 1369-1377). Decreasing muscular tissue (lean body mass) in the elderly increases non-communicable diseases such as diabetes mellitus, cancer, cirrhosis, rheumatoid arthritis and chronic obstructive pulmonary disease (Prado and Heymsfield,



2014, pp. 940-953). Based on PM sources, this is in line with changing normal physiology of body tissues following increasing porosity and disease susceptibility. Tissue loosening is mentioned as decreasing lean body mass increases the chance of disease chronicity. The ratio of lean body mass to adipose tissue mass is a marker of dietary quality and disease risk ratio. In PM, muscular tissue is considered condensed tissue, that their wasting leads to increased porosity (Prado and Heymsfield, 2014, pp. 940-953).

Dietary factors and physical activity contribute to body composition. Any changes in diet and physical activity affect anthropometric indexes that are more accessible than specialized imaging. Comparing anthropometric indexes between the two sexes showed that these indexes, besides cardiopulmonary function in boys, are higher than in girls (Zapartidis et al, 2009, pp. 22-28) that, are in accordance with PM sources citation as a more condensed body of men compared with women.

Discussion

There are some points in common between traditional and conventional medicine in the context of porosity and condensity. The relation between diet and *sohaneh* (physique) is an example; people with differing *sohaneh* (physique) respond differently to the same nutritional diet. This almost parallels the kind of response differential to the same regimen by people of diverse degrees of condensity and porosity.

The general approach of PM would be that the porosity of organs puts them at (higher) risk of diseases. Higher permeability of porous organs to penetration of toxic matters, on the one hand, and incompetency in the expulsion of waste, on the other hand, are the proposed mechanisms in PM whereby a greater likelihood of morbidity and co-morbidity befalls porous organs. Previous studies have shown different viscoelastic properties of cancer cells: their softness is more than normal cells (Rebelo et al, 2013, p. 055102). This finding brings out to a high degree of exactness the strength of the explanatory rationale of PM when it asserts that within the first stage of cancerous mass inception, the affected organ loses its condensity and becomes porous. Then, the morbid black bile (*soada*) penetrates the affected organ [tissue]: after a long time, the organ stiffens, and the hard mass transmogrifies to cancerous mass (Avicenna, 2014, p. 47).

According to PM sources, the average condensity of the body organs seems to be an optimum state for health maintenance. Nutritional modalities which maintain the average condensity and correct the porosity of the organs may well contribute to renal failure prevention based on the PM methodology. In PM, there are some treatment modalities including aromatherapy and the application of poultice and compress to rehabilitate the porous tissues condensity. Using some astringent herbal remedies with poultice strengthens the organ stability and condensity. Any foreign heat could affect the susceptible weak organ, and the porosity and loosening of the organ would follow subsequently. Having lost its condensity and strength, the afflicted organ could not function properly: it would be quite vulnerable to influx of morbid matters and waste from the adjacent organs, and even from further organs through blood circulation. This is hypothesized as an important factor for initiation of subtle stages of chronic non-communicable diseases.

These having been said, inducing porosity in some organs or tracts may help alleviate the disease symptoms. For example, urinary tract porosity facilitates the motion of trapped waste and relieves the obstruction induced by renal stones. There are causes for body organs solid edema such as abnormal (alien) heat and humor [foreign to body], mentioned as *asbab-e-marazi* (pathogenic) by Persian sages in PM sources. Such a process, for instance, occurs in the solid edema of the liver which is usually diagnosed too late, i.e., in the ad-



vanced stages. Based on Dr. Mostafavi's deliberation, *estessqa'* (dropsy) is equivalent to liver cirrhosis –it could be diagnosed in the early onset by the computed tomography (CT) scan and magnetic resonance imaging (MRI) (Mostafavi Kashani, 2015, p. 123).

A recent article focusing on the process of kidney stiffness and its relation with renal artery stenosis may be a good source for relating the said condition with the kind of porosity mentioned in PM sources. The stenosis ends in decreasing blood circulation responsible for nourishing the kidney tissue. Later, irreversible kidney fibrosis compromises the vital renal function and finally leads to renal failure. In the animal model, the renal stenosis causes irreversible renal fibrosis and failure in about 10 weeks: this is based on new imaging methods. Decreasing the turgor of the afflicted renal tissue and increasing the plasticity of the kidney are theorized to be the causes of the irreversible damage to the involved kidney. (Warner et al, 2009)

Nowadays, finding a nonaggressive method for early diagnosis of kidney malignancies and low-grade tumors is a challenge to researchers and clinicians. The tumors and abnormal renal tissues can be differentiated by their different stiffness from the normal neighbor tissues. Accordingly, a new method with high diagnostic value has appeared to differentiate the specific stiffness of these pathologic tumors from the neighboring tissue of normal elasticity (through a noninvasive method). In another study, magnetic resonance elastography (MRE) was applied for tumor diagnosis (Bensamoun et al, 2011, pp. 284-287). The stiffness of the other body organs, such as the spleen, pancreas, and bowels, has also been studied with this imaging method (Yin, 2012, pp. 1981-1981).

Indeed, the human body cannot overall be considered a dense pack of materials. Our bodies have many cavities; for example, our bones do not have constant densities throughout. Where force exerted per unit area is higher, the bone is denser. The outer region is also made of compact bone, while the inner side is not.

Taken as a whole, modern biophysics can well elucidate the justification of what has, for many centuries, been treated in Persian Medicine under the terminology of *Takhalkhol* (porosity) and *Takasof* (condensity).

Conclusion

Condensity and porosity are two fundamental issues frequently cited in PM sources. The condensity/porosity balance contributes to health maintenance and disease prevention. This not only covers the general body health but also that of each specific organ. Striking the aforementioned balanced can also play a major part in diminishing chronic diseases. Choosing a proper modality, including diet, pharmacotherapy, and manual therapy, depends on the amount of the considered organ's porosity/stiffness against its preferred level of stiffness/porosity in a normal healthy state.

In conventional medicine, other than observing the physique itself, researchers recently considered a new diagnostic technique, getting aid from the equipment that evaluates and measures the amount of porosity/condensation of the body organs. Decreasing condensity and increasing the plasticity of the afflicted organs are nearly equally the same as the notion of PM porosity. According to PM sources, some medical interventions and nutritional measures mentioned by the Persian sages in their treatises, balancing the porosity and condensity of the organs, may be helpful in the prevention of chronic disease –especially kidney and liver ailments.

Acknowledgements

The authors would like to thank Engineer Sanaye for his contribution to the manuscript's



linguistic edition.

Conflict of Interest

There is no conflict of interests.

References

- Abdollah, M.I.M., 2004. *Tohfeh Khani*. Tehran: Iran University of Medical Science.
- Aboozaid, A.I.Z., 2007. *Masaleh Al-Abdan Val-Anfos*. Cairo: Makhtootat Al-Arabia.
- Aghili, M., 2006. *Kholase Al-Hekmah*. Qom: Esmailian.
- Ahmadi, N., Mokaberinejad, R., Saeidi, A., Zandi, A., Leach, M.J., and Pasalar, M., 2020. The effect of chickpea broth on knee osteoarthritis—A Pilot non-randomised open-labeled clinical study. *Advances in Integrative Medicine*, 7(3), pp. 121-125.
- Anvari, S., and Anvari, A., 2012. Porosity and Condensity in Islamic physics. *Philosophy and Kalam*, 1, pp. 23-54.
- Arzani, M. 1915. *Mofareh Al-Gholu*. Lahoore: Salim Lahoore.
- Arzani, M.A. 2008. *Tib-e-Akbari*. Qom: Jalal-ed-Din.
- Atarzadeh, F., Daneshfard, B., Dastgheib, L., Jaladat, A. and Amin, G. 2016. Early Description of Diet-Induced Blistering Skin Diseases in Medieval Persia: Avicenna's Point of View. *Skinmed*, 14, pp. 367-370.
- Avicenna, H., 1985. *Al-Shefa*. Qom: Marashi Najafi Library.
- Avicenna, H., 2007. *Koliat-e-Ghanoon*. Tehran: Tehran university of medical science.
- Avicenna, H., 2014. *Canon in medicine*. Tehran: Darol Ehya.
- Azamkhan, M., 2008. *Exir Azam (The Great Elixir)*. Tehran: Institute of Meical History, Islamic Medicine and Complementary Medicine; Iran Medical University.
- Azamkhan, M., 2010. *Nai'ier-e-Azam*. Tehran: Al-ma'ee.
- Bensamoun, S.F., Robert, L., Leclerc, G.E., Debernard, L., and Charleux, F., 2011. Stiffness imaging of the kidney and adjacent abdominal tissues measured simultaneously using magnetic resonance elastography. *Clinical imaging*, 35, pp. 284-287.
- Cheghmini, M.I.M., 2010. *Ghanooncheh*. Tehran: Alma'ee.
- Cosquéric, G., Sebag, A., Ducolombier, C., Thomas, C., Piette, F. and Weill-Engerer, S., 2006. Sarcopenia is predictive of nosocomial infection in care of the elderly. *British Journal of Nutrition*, 96, pp. 895-901.
- Daneshfard, B., and Jaladat, A.M., 2016. Male Infertility and Diet: A Perspective of Traditional Persian Medicine. *Galen Medical Journal*, 5, pp. 103-104.
- Gallen, 2008. *Majmmo'e Hasht Ketab-e-tebbi*. Tehran: Iran University of Medical Science.
- Gilani, M.K., 2008. *Hefz-o-Sehheh Naseri*. Tehran: Al-ma'ee.
- Hakimi, M.R., 1986. *Azkiya Al-Atebba*. Beiroot: A'lami.
- Halabi, I.S., 2009. *Ghayat Al-Etghan*. Tehran: Iran University of Medical Science.
- Ibn Abbas, A., 2008. *Kamel Al-Sana Al-Tebbiah*. Qom: Jalal-el-Din.
- Ibn Elyas, M.I.M., 2004. *Kefayeh Mansoori*. Tehran: Iran University of Medical Science.
- Ibn Eshagh, H., 1978. *Al-Masael*. Cairo: Dar Al-Jameat.
- Jaladat, A.M., Tonsaz, M., Attarzadeh, Z., and Attarzadeh, F., 2013. Sexual ethics in Iranian medicine. *Islamic Lifestyle Centered on Health*, 1, pp. 43-47.
- Jorjani, E., 2001. *Zakhire Kharazmshahi*. Tehran: Iranian Medical Academy.
- Jorjani, S., 2006. *Al-Aghraz al-Tibbia Val Mabahess al-Alaiia*. Tehran: Tehran University Press.



- Kalantari, T., Bahmani, M., Heydari, S.T., Daneshfard, B., Nematollahi, Z., and Nimrouzi, M., 2018. Effect of Temperament on Happiness and Job Satisfaction in University Employees. *Pakistan Journal of Medical and Health Sciences*, 12, pp. 915-917.
- Mostafavi Kashani, S.J., 2015. *Majmooe Asar*. Tehran: Tebe Sonati Iran.
- Nimrouzi, M., Daneshfard, B., Tafazoli, V., and Akrami, R., 2019. Insomnia in Traditional Persian Medicine. *Acta medico-historica Adriatica*, 17, pp. 45-54.
- Nimrouzi, M., Mahbodi, A., Jaladat, A.M., Sadeghfard, A., and Zarshenas, M.M., 2014. Hijamat in Traditional Persian Medicine: Risks and Benefits. *Journal of Evidence-Based Complementary and Alternative Medicine*, 19, pp. 128-136.
- Nimrouzi, M., Salehi, A., Ahmadi, A., and Kiani, H., 2015. Avicenna's Medical Didactic Poem: Urjuzehtebbi. *Acta Medico-Historica Adriatica*, 13, pp. 45-56.
- Nimrouzi, M., Tafazoli, V., Daneshfard, B. and Zare, M., 2016. Optimal fluid intake in daily diet: Avicenna's view. *Journal of integrative medicine*, 14, pp. 241-244.
- Nimrouzi, M., and Zarshenas, M.M., 2015. Holistic approach to functional constipation: Perspective of traditional Persian medicine. *Chinese journal of integrative medicine*, pp. 1-6.
- Ormsbee, M.J., Prado, C.M., Ilich, J.Z., Purcell, S., Siervo, M., Folsom, A., and Panton, L., 2014. Osteosarcopenic obesity: the role of bone, muscle, and fat on health. *Journal of cachexia, sarcopenia and muscle*, 5, pp. 183-192.
- Pichard, C., Kyle, U.G., Morabia, A., Perrier, A., Vermeulen, B. and Unger, P., 2004. Nutritional assessment: lean body mass depletion at hospital admission is associated with an increased length of stay. *The American journal of clinical nutrition*, 79, pp. 613-618.
- Prado, C.M., and Heymsfield, S.B., 2014. Lean tissue imaging a new era for nutritional assessment and intervention. *Journal of Parenteral and Enteral Nutrition*, 38, pp. 940-953.
- Prado, C.M., Siervo, M., Mire, E., Heymsfield, S.B., Stephan, B.C., Broyles, S., Smith, S.R., Wells, J.C., and Katzmarzyk, P.T., 2014. A population-based approach to define body-composition phenotypes. *The American journal of clinical nutrition*, 99, pp. 1369-1377.
- Qef, I., 1925. *Al-Omdeh Fi Al-Jerahe*. Heidarabad: Majlis.
- Razi, B.A.D., 2003. *Kholase Al-Tajarob*. Tehran: Iran University of Medical Sciences.
- Razi, M., 2005. *Al-Havi*. Tehran: International Academy of Medical Sciences.
- Rebelo, L., De Sousa, J., Mendes Filho, J. and Radmacher, M. 2013. Comparison of the viscoelastic properties of cells from different kidney cancer phenotypes measured with atomic force microscopy. *Nanotechnology*, 24, p. 055102.
- Roubenoff, R. and Kehayias, J. J. 1991. The meaning and measurement of lean body mass. *Nutrition reviews*, 49, pp. 163-175.
- Warner, L., Yin, M., Ehman, R. and Lerman, L. 2009. Kidney stiffness measured in an animal model of unilateral renal arterial stenosis using 2D MR Elastography. *Proceedings of the International Society for Magnetic Resonance in Medicine*. April 18Y24.
- Yin, M., 2012. Abdominal magnetic resonance elastography. *The Journal of the Acoustical Society of America*, 132, pp. 1981-1981.
- Zahravi, A., 2004. *Al-Tasrif*. Kuwait: Al-Kuwait.
- Zapartidis, I., Vareltzis, I., Gouvali, M. and Kororos, P. 2009. Physical fitness and anthropometric characteristics in different levels of young team handball players. *The Open Sports Sciences Journal*, 2, pp. 22-28.

