





Approach to “Belching Disorder”: A Review of Avicenna’s Point of View in Comparison With Modern Medicine

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Abstract

Objectives: Excessive belching is a common complaint that may be observed alone or with other diseases such as indigestion and reflux. In addition, it has adverse effects on patients’ social life. Due to the insufficient evidence regarding the successful treatment of this disorder, the present study reviewed the medical views of Avicenna in order to find a better solution in this regard.

Methods: This literature review was done by searching for “belching” and its MeSH heading term, namely, “eructation” in databases such as Google scholar and Pub Med and their synonyms in Iranian traditional medicine “Josha” in Avicenna’s “*Canon of Medicine*”.

Results: The definition of belching in modern medicine was the same as “Josha” but its classifications and treatments were different. Modern scientists have divided excessive belching into gastric and supragastric based on its source although Avicenna classified it into three kinds based on its smell. In recent studies, specialists have come to a link between the brain and the stomach due to the inadequacy of their therapies while Avicenna has along pointed out the relationship between belching and certain organs. He further recommended three main approaches for its treatment, including lifestyle modification, herbal medicines, and physical manipulations.

Conclusions: In general, considering the lack of effective treatment for excessive belching, it is important to present a better classification and management. This might be possible with regard to Avicenna’s “*Canon of Medicine*”. Thus, clinical trials are suggested to assess the efficacy of Avicenna’s recommendations as a complementary method.

Keywords: Belching, Eructation, Iranian traditional medicine, Persian medicine, Avicenna

Context

Eructation or belching is defined as an audible outflow of gas from the esophagus or the stomach into the pharynx (1). Excessive belching is a prevalent complaint which may be observed alone or along with other diseases including indigestion and reflux (2). Even though excessive belching is a benign disorder, it may develop adverse effects on patients’ social life and reduce their quality of life (3-5).

Despite the Rome diagnostic criteria in modern medicine, there are disagreements among scholars on the classification and the clinical symptoms of excessive belching disorder. In some studies, it is observed that the rate of air swallowing is not significantly different between normal subjects and those with gastric and supragastric belching. Therefore, it seems that the Rome criteria are not well efficient in the classification of patients with excessive belching (4,6).

The use of complementary medicine in recent years has increased in patients who refer to gastroenterology

clinics, especially those who are not satisfied with their treatments (7-10). The medical opinions of Avicenna, the Iranian Muslim scientist of the 10th and 11th centuries AD who has a leading role in the history of medicine worldwide, are presented in his main book the “*Canon of Medicine*”. This book served as an important reference for medical education up to the 17th century (11-25).

Due to the shortcomings of new classifications in the diagnosis and treatment of the belching disorder and with regard to the rich sources of Iranian traditional medicine (ITM), particularly Avicenna’s points of view, getting help from the traditional medicine in addition to modern treatments is necessary for better management of the belching disorder. To the best of our knowledge, our study is the starting point for this integrative approach.

Evidence Acquisition

In this literature review, the synonym keywords of “belching and “eructation” were searched in PubMed and Google

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scholar databases. Eleven review articles were found out of which, the English articles with full texts were selected for analysis. Avicenna's points of view were extracted and classified by searching the keyword "Josha" in his most important book entitled the "*Canon of Medicine*" with the help of "Noor Digital Library of Medicine". This keyword has the most overlap with the definition of belching. Furthermore, the chapter related to the diseases of stomach and headaches, "Nazleh" (catarrh or postnasal discharge) and "Melancholia" (depression) from the chapter of brain diseases of the book "*Canon of Medicine*" were studied as related diseases. Then, eating habits from the chapter of "hifz'ol-sehat" (health preservation and lifestyle) were examined for more information about treatment options, followed by comparing and classifying the contents. The scientific names of the reported herbs were confirmed using some textbooks such as Popular Medicinal Plants of Iran (26) and Dictionary of Medicinal Plants (27), along with "the Plant List" (<http://www.plantlist.org/>) suggested by the research team.

Results

The contents in both medical doctrines were raised according to the definition, pathophysiology, classification, causes, and treatment of belching. Notably, Avicenna referred to "Josha" as a symptom of stomach diseases and then mentioned excessive belching (Josha'ol-mofrat) as a disease. He wrote about the treatment of its two common types. However, belching is discussed as a functional disorder in modern medicine articles that might sometimes be followed by other diseases (28).

Definition of Belching in Modern Medicine

In modern medicine articles, belching is defined as the "Noisy release of air from the esophagus or stomach toward the pharynx" (1). Further, belching is part of people's natural behavior, but it is considered a disorder if it is repeated frequently and uncontrollably. The epidemiology and prevalence of excessive belching still require a comprehensive review. However, in some papers, it is reported that about 3.4% of patients with gastrointestinal diseases refer to medical care centers due to excessive belching (1,29).

Burp Mechanism

In each swallow, a certain amount of air naturally enters the mouth. Along with the esophageal peristalsis movement and esophageal sphincter relaxation, this amount of air enters the stomach with the food mass. Then, the entered air is accumulated in the proximal part of the stomach. After eating flatulent foods and fizzy drinks, a lot of air is aggregated in the proximal part of the stomach. To keep the stomach from bloating and tension caused by the accumulated air, there is a natural air drainage system in the stomach. Moreover, the dilatation of the proximal body of the stomach stimulates stomach wall receptors

and the vagal system reaction leads to the relaxation of the distal esophagus valve. Due to pressure, the air inside the stomach moves toward the mouth through this channel. Additionally, the air that moves upward causes the esophagus dilation and develops secondary peristalsis, leading to the relaxation of the upper esophagus sphincter and air expelling. Therefore, belching is the act of expelling the air from the stomach through the mouth which occurs through the relaxation of the distal esophagus sphincter and might sometimes be noisy (1,30,31).

Belching Classification in Modern Medicine

Belching is a functional disorder in which the patient suffers from excessive belching for more than three days a week for three months with a duration of at least six months prior to diagnosis. According to the Rome III criteria, this disorder was divided into "unspecified excessive belching" and "aerophagia" subgroups (1,4,32,33). Based on this classification, a patient is placed in the aerophagia group when he suffers from annoying excessive belching and a certain amount of air swallowing is observed in medical examinations. There is often no organic abnormality in such patients. They might belch 20 times per minute and, as reported, the number of belches increases during stress and anxiety. The difference between the unspecified excessive belching and aerophagia is that in the conducted studies, the amount of air swallowing is normal in patients with unspecified excessive belching (4).

The advent of the combined esophageal "multichannel intraluminal impedance-pH" (MII-pH) monitoring in the 1990s made it possible for the researchers to lively examine the direction of the liquid and airflow in the esophagus. The review of the belching mechanism by this machine made a revolution in belching classification and led to the update of the Rome criteria. In the Rome IV criteria that appeared in 2016 and 10 years after Rome III, it was divided into "gastric belching" and "supragastric belching" based on the belching mechanism (1,28). To distinguish these two types of belching, the objective intraluminal impedance measurement is used as the golden standard (1,29). In healthy people without symptoms, supragastric belching occurs up to 13 times in over 24 hours in 95% of cases. Therefore, this amount is considered as the upper limit of normal in many cases (29).

In supragastric belching, the air enters the esophagus and immediately expels before reaching the stomach. Thus, the lower esophageal sphincter does not need relaxation for an incidence of this type of belching. More precisely, in supragastric belching, the belch originates from the air of the space above it instead of the stomach. On the other hand, gastric belching is a spontaneous reaction that occurs through the relaxation of the lower esophageal sphincter and the stomach air discharge to the esophagus and is often a natural occurrence that prevents the dilatation of the stomach and intestines after eating (1,29).

In supragastric belching, by “high-resolution manometry”, two mechanisms are known for the ingress of the air into the esophagus, including “air suction and air injection”. In air suction, the diaphragm movement creates a negative pressure in the chest area like that in inhalation. However, in the injection method, the contraction of the pharynx muscles and thus the increase of the pharyngeal pressure cause the return of the air to the esophagus. Additionally, both trends cause a sudden increase in the abdominal and esophageal pressure and lead to the flow of air toward the mouth and belching. Therefore, in this case, belching occurs without swallowing a lot of air and thus, the use of the term “aerophagia” does not seem to be correct (1,29).

Some studies found that when the person under study knows that his belching is controlled, the number of belches is more than the time he is not aware of it. Moreover, belching stops during speaking and sleep. Accordingly, a new theory was formed that considered this disorder as a behavioral disorder. Therefore, the concept of the disorders of the Gut-Brain Interaction was added to the Rome IV classification of the definition of functional disorders. Excessive belching in patients with anxiety disorders, obsessive-compulsive disorders, bulimia nervosa, and encephalitis verifies the psychological aspect of supragastric belching (1,29,30).

Belching Treatment

Patients with excessive belching often suffer from loneliness and social isolation and further investigation shows that their quality of life decreases, as well. There is not much evidence for the successful treatment of supragastric belching (1). In addition, the best treatment for excessive belching is not yet known although according to the conducted studies, the use of a diet and lifestyle modification is recommended, including avoiding carbonated drinks, sucking on candies and chewing gum, avoiding gulping and encouraging the patient to chew food well, as well as receiving behavioral therapy and biofeedback. Taking medications that reduce bloating (e.g., simethicone and dimethicone) is not often very effective. Thus, patient education on the belching mechanism and awareness of the patients of their problem with the emphasis on correct swallowing is one of the methods which is used to solve this problem. Sometimes, it is necessary to refer the patient to speech therapy to learn diaphragmatic breathing, along with the vocal cords. Breathing exercises enable the patient to act contrary to the mechanism that he has learned and repeats unconsciously. Given that the belching mechanism and the gastroesophageal reflux disease are close to each other, medications that are taken for gastroesophageal reflux disease can be effective for belching as well. For example, the gamma-aminobutyric acid (GABA) receptor agonists like baclofen can sometimes reduce the symptoms. Nevertheless, not many studies have confirmed the

effectiveness of the drug (1,3,30,34-37).

The GABA receptor agonists decrease the relaxation frequency of the lower esophageal sphincter and can be useful for reducing both gastric and supragastric belching. The treatment of “gastric belching” is somehow the same as “supragastric belching,” but severe acute “gastric belching” occurs more in mentally disabled patients and can lead to obstruction and respiratory disorders. In such circumstances, nasogastric intubation can reduce the patients’ problems. Sedatives can also reduce the amount of air swallowing and the frequency of belching. Moreover, patients with gastric belching should avoid fizzy drinks and eat quickly and speech therapy and respiratory exercises are helpful as well (1).

Definition and Classification of “Josha” in the Canon

Avicenna in his book, the “Canon of Medicine”, referred to belching as “Josha” It is one of the symptoms of gastric diseases (38). He also mentioned “excessive belching (Josha’ol-mofrat)” as a disorder and separately explained its causes and classification (39). According to the definition in the ITM dictionary, “Josha” or belching is the condition that is caused by the outflow of gas through the mouth (40,41). Avicenna also used the term “Ascending gas” for “Josha,” which means the gas that outflows from the top (mouth). The term “descending gas” is used for the gas that is released from the anus and the term “trapped gas” is applied for the bowel sound, which implies the gas which does not flow out and only moves in the belly and produces a sound. It is clear that Avicenna considered the gas inside the stomach as the origin of belching (38).

According to Avicenna, the food that enters the stomach after the gastric digestion process enters the liver through mesenteries. It faces another phase of digestion (hepatic digestion) in the liver. Then, it goes out of the liver. While leaving the liver, it turns into four different groups of materials. In ITM, the set of these four groups of materials is called “humor” (*Khelt*). These humors are named “blood”, phlegm”, “yellow bile”, and “black bile”. In addition, these materials flow in the body through the vessels. Each humor can leave the vessels naturally and particularly accumulate in some organs. Sometimes, the humors aggregate abnormally in one organ (42-45).

The temperament (*Mizaj*) of that organ gets unbalanced if each one of the four humors becomes less or more than the normal state. Unbalanced *mizaj* in each body organ causes the dysfunction of that organ. This change in the body is known as a disease called “*Su-e-Mizaj*” or “dystemperament” which is of two different kinds of cold (*Su-e-Mizaj-e Barid*) and warm (*Su-e-Mizaj-e Ha’r*) dystemperament. From Avicenna’s viewpoint, a change in some of these four humors in the stomach and then its temperament can lead to stomach dysfunction (44-46).

According to Avicenna, belching occurs when a dystemperament (*Su-e-Mizaj*) or humor accumulation occurs in the stomach or the other organs of the human

body. He classified belching based on its odor and then stated the cause accordingly. In his initial classification, Avicenna divided belching into odorless belching, the belching with eaten food smell and malodor belching (38).

Odorless Belching

Avicenna believed that odorless belching is the safest or the least problematic one (38). Further, he mentioned different kinds of odorless belching according to its outflow time and amount. If odorless belching occurs within a short span of eating food, with frequency, or not accompanied by other symptoms of gastric diseases such as abdominal heaviness and bloating, regurgitation, and nausea after the meals, it is normal and does not require treatment. This kind of belching is a sign of the natural digestion process in the stomach (47). Excessive odorless belching depends on the kind of food and the manner of eating. In other words, it can be caused by eating flatulent food, eating quickly, or drinking water during or after eating food (47,48). Furthermore, odorless belching which is caused by hunger is a sign of raw moisture (undigested food) in the stomach. The moisture might have developed in the stomach due to eating heavy food (47,48).

Belching With Eaten Food Smell (Food Odor Belching)

Avicenna believed that this kind of belching results from the weakness of the digestive process in the stomach so that the stomach is unable to digest food in the expected time. Consequently, the food smell is felt by the olfactory organs through belching (38,49).

Malodor Belching

Avicenna mentioned several types of malodor belching, including Dokhani (smoky), Hamez (sour with a stench of rancidity), Sahaki (the stench of sweat or meat), Samaki (fishy), Hemaiei (black mud or sludge), Zangari (corrosion), Zohmi (the stench of raw fat and meat), and Montan (the stench of infection). He also considered these malodor belches as a disease that requires treatment. Among different kinds of malodor belching, he only explained smoky and sour belching since they are more prevalent (38).

Belching Etiology

Based on the ITM textbooks, the belching etiology can be divided into internal and external factors. The internal factors are the causes of belching inside the human body. Gastric disorders such as dis-temperament and humor excess, weakness, stomach ulcer, and inflammation, flaccid stomach, and the disorders of the other organs (e.g., the spleen, along with intestine and postnasal discharge) are considered as internal factors. External causes include the lifestyle factors that affect the human body from outside like insomnia, eating food quickly, flatulent foods, and the foods that are especially susceptible to develop certain kinds of belching.

Belching Treatment From Avicenna's Point of View

In the ITM, the first step to treat any disease is to remove its causes. With regard to the belching etiology, treatment was given in several steps according to Avicenna's viewpoint (Table 1).

Avicenna recommended three main approaches for the belching treatment, including lifestyle modification, simple and mixed herbal medicines, and physical manipulations, such as rubbing the stomach with oils. As he emphasized the prevention of diseases rather than its cure, the first step is "lifestyle modification" according to the "six essential lifestyle factors" (50). For example, eating quickly, drinking too much water immediately after the meals, and eating flatulent foods (e.g., lentils and beans) are among the important factors that develop gas, bloating, and belching. These causes can be removed by modifying eating manners and the types of consumed foods. Additionally, insomnia is considered as another factor that influences the development of belching, which must be modified in the first stage of the treatment (38,48).

Treatment in the next step is provided by cleansing the stomach from the cause of the disease (i.e., the removal of waste materials inside it and temperament conversion). In this case, the treatment varies based on the type and the rate of deviation from the temperament (51), the related data are provided in Table 2.

Avicenna also has some recommendations for the treatment of excessive belching, separately. For excessive sour belching, he advised filafeli juice (a compound with pepper) and dry coriander. For simple smoky belching, he suggested cooling the temperament with cold-temperament foods and the fruit paste. 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. For those who cannot belch and suffer from bloating and stomachaches, Avicenna recommended the use of belch-causing herbs (48), the details of which are presented in Table 3.

Conclusions

Although the definition of belching or eructation in modern medicine and "Josha" in ITM is almost the same, their classifications and treatments are different. Some of Avicenna's explanations for the classification and etiology of the belching disorder are based on the temperament (*mizaj*) theories and thus current medical concepts cannot explain it, but his comments have the potential for improving modern medical practice.

In a recent classification of excessive belching in the Rome VI, the gut-brain interaction is mentioned, but the interaction between the stomach and the other body organs is still unknown. According to Avicenna, the stomach as the input source of food and medicine to the body plays an important role in regulating the temperament of the

Table 1. Avicenna' Viewpoints About the Belching (Josh)h

The Type of Belching	Cause	Accompanied Symptoms	Treatment		
Odorless	Normal	A short time after a meal	Needing no treatment		
	Resulting from flatulent food and bad eating habits	No other symptoms	Observing the customs of eating and abstinence from flatulent food and drink		
With the eaten food smell	Stomach weakness	Nausea, Abdominal heaviness, Bloating and abdominal distention after the meal, Bowel sound, Hiccups	Cleansing the stomach by drinking a lukewarm water; Inducing vomiting; Warming the abdomen by rubbing some oil; Consuming healthy and light foods; Eating little and sleep enough on the left side		
		Smoky	Simple hot dystemperament	Insomnia, Lack of bile in the vomit, Lack of anal burning after the defecation	Modifying the temperament with the paste of cold-temperament fruit and the refrigerant food
	Special cooking process	Hot dystemperament with the excess humor	Symptoms of the bile in the vomit, Anal burning after the defecation, Hot catarrh	Wormwood ^a , Ayarij ^b	
		Food integrated with the smoke	It develops after eating foods like egg yolk and radish	Changing the type of food and its cooking style	
Malodor	Simple cold dystemperament	Microphagous ^c , Little thirst, Slow digestion	Avoiding heavy, fatty, and cold-temperament foods like fast foods; Bishop's weed fruit ^d ; Cinnamon and Cumin tonics; Ginger jam; Rubbing the stomach with the warm oils such as mastic, chamomile, Lilies, and Henna; Drinking the filafeli juice ^e ; Dried coriander before the meal		
			Sour	Cold dystemperament with the excess humor	Feeling a permanent heaviness in the stomach, Cold catarrh
	Other abnormal malodors	Stomach ulcers and rashes	Pain, Shortness of breath, Cold body, Wound shell in the stool, Increasing the number of belches	It develops after eating the sweet foods, Inflammation and mouth bitterness, Thirst, Benefiting from the cold-temperament foods	Modifying the temperament with a fruit or paste ^f of cold-temperament fruit and refrigerant food
				Consuming astringent drugs; Eating easily digested foods; Cleansing the stomach by drinking rosewater and hydromel, quince and pomegranate juice, Ma'alshaer ^g , and Ma'alromman ^h	

Note. ^a: Artemisia Absinthium L.; ^b: Aloe vera, the dried juice of leaf; ^c Increased appetite; ^d It is one of the best treatments; ^e A compound with pepper; ^f Concentrated juice with sugar; ^g Barley water; ^h Pomegranate juice.

Table 2. Simple Herbal Medicines for Belching Disorder due to the Cold Dystemperament

Persian Name	Scientific Name	Common Name	Applied Parts
Parsiavashan	<i>Adiantum capillus-veneris</i> L.	Maidenhair	Leaves
Fudanaj	<i>Mentha longifolia</i> L.	Wild Mint	Leaves
Khulenjan	<i>Alpinia officinarum</i> Hance	Galangal	Rhizome
Sakbeenaj	<i>Ferula persica</i> Willd.	Sagapanum	Root
Nankhah or Zenian	<i>Trachyspermum ammi</i> L. Sprague or <i>Carum copticum</i>	Bishop's weed fruit	Seed
Kashem	<i>Ferulago angulata</i> (Schltdl) Boiss	-	Root and seed
Zireh-sabz	<i>Cuminum cumin</i> L.	Cumin	Seed
Sudab	<i>Ruta graveolens</i> L.	Common Rue	Seed
Khorva' (karchak)	<i>Ricinus communis</i> L.	Castor bean	Oil
Gha'r	<i>Laurus nobilis</i> L.	Sweet bay or Laurel berry	Seed and leaves

other organs. That is why gastric disorder sometimes contributes to the development of other diseases such as mood disorders, headache, backache, and heart diseases (52,53). Furthermore, the stomach occasionally becomes ill under the influence of the other diseases of the organs. Sometimes, weakness and exhaustion, as well as mood

and behavioral disorders cause some complications in the stomach which results in gastrointestinal symptoms (52).

According to this theory presented in the "Canon of Medicine," belching was also mentioned as one of the symptoms of dystemperament in some neurological disorders such as depression and headache. In his

Table 3. The Belch-causing Herbs in "Canon of Medicine"

Persian Name	Scientific Name	Common Name	Applied Parts
Marzeh	<i>Satureja hortensis</i> L.	Savory	Leaves
Fudanaj	<i>Mentha longifolia</i> L.	Wild Mint	Leaves
Kondur	<i>Boswellia sacra</i> Flueck	Oliban	Resin
Razianeh	<i>Foeniculum vulgare</i> Mill.	Fennel	Seed
Filfil	<i>Bunium persicum</i> (boiss) B. Fedtsch	Kerman wild caraway	Seed
Mikhak	<i>Syzygium aromaticum</i> L.	Clove	Flower and seed
Mastic	<i>Pistacia lentiscus</i> L.	Lentisk pistache	Resin

classification, Avicenna raised the relationship between belching and postnasal discharge, joint pain, as well as some brain disorders, which are less observed in modern medicine articles.

As recommended by Avicenna, in the treatment of belching, it is necessary to note which organ has initially suffered from dystemperament. Since the symptoms of the disease are treated with regard to the etiology, the priority during the treatment should be the elimination of the main cause (38,52,54). It seems that the treatment failure in modern medicine is due to an inappropriate classification and a misdiagnosis of the main cause. According to Rome VI criteria, excessive belching is bothersome belching from the esophagus or stomach more than 3 days a week. Most importantly, a high-resolution manometry and impedance are needed for the diagnosis of gastric from supragastric belching. Although modern scientists found the relation between the gut and brain, they neglected the effect of other organs and have so far failed to achieve a successful treatment so far. Nowadays, the World Health Organization strongly emphasizes the use of traditional medicine besides modern medicine (50,55)

It seems that some angles of the problem are still hidden from the vision of modern specialists in comparison with Avicenna's point of view. Paying attention to the belching, the odor is one of those angles that might be able to contribute to a better classification of this disorder. Even though this symptom is usually forgotten during the history taking, the incidence of some other diseases like stomach ulcer might be predictable through the belching odor. Furthermore, it seems that getting help from Avicenna's recommendations (i.e., using lifestyle modification and traditional treatments, especially when common treatments are not effective) can make a difference in the treatment of excessive belching.

Our study limitation was the lack of knowledge in the scientific population about the ideas of Avicenna, which has led to a decline in the number of clinical trials for the efficacy of these herbal medicines. No clinical trial was found on the effects of the mentioned plants on the eructation except for *Carum copticum* (56) or *Trachyspermum ammi* and thymol and carvacrol are its main ingredients. In addition, its seeds have various important medicinal properties such as antipyretic, antitussive, antispasmodic and vasodilator,

respiratory, hepatoprotective, urogenital, gastrointestinal, antiparasitic, antimicrobial, and lipid-lowering effects (57). Finally, more clinical trials are suggested to assess the efficacy of the other Avicenna's recommendations as a complementary method.

Conflict of Interests

Authors have no conflict of interests.

Ethical Issues

The present study was approved by the Local Ethics Committee of Shahid Beheshti University of Medical Sciences under the ethical code of 1395-627.

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References

1. Stanghellini V, Chan FK, Hasler WL, et al. Gastrointestinal disorders. *Gastroenterology*. 2016;150(6):1380-1392. doi:10.1053/j.gastro.2016.02.011
2. Koukias N, Woodland P, Yazaki E, Sifrim D. Supragastric belching: prevalence and association with gastroesophageal reflux disease and esophageal hypomotility. *J Neurogastroenterol Motil*. 2015;21(3):398-403. doi:10.5056/jnm15002
3. Bredenoord AJ. Management of belching, hiccups, and aerophagia. *Clin Gastroenterol Hepatol*. 2013;11(1):6-12. doi:10.1016/j.cgh.2012.09.006
4. Li J, Xiao Y, Peng S, Lin J, Chen M. Characteristics of belching, swallowing, and gastroesophageal reflux in belching patients based on Rome III criteria. *J Gastroenterol Hepatol*. 2013;28(8):1282-1287. doi:10.1111/jgh.12187
5. Bredenoord AJ, Smout AJ. Impaired health-related quality of life in patients with excessive supragastric belching. *Eur J Gastroenterol Hepatol*. 2010;22(12):1420-1423. doi:10.1097/MEG.0b013e328340887c
6. Bredenoord AJ, Weusten BL, Sifrim D, Timmer R, Smout AJ. Aerophagia, gastric, and supragastric belching: a study

- using intraluminal electrical impedance monitoring. *Gut*. 2004;53(11):1561-1565. doi:10.1136/gut.2004.042945
7. Abolhassani H, Naseri M, Mahmoudzadeh S. A survey of complementary and alternative medicine in Iran. *Chin J Integr Med*. 2012;18(6):409-416. doi:10.1007/s11655-012-1124-9
 8. Hung A, Kang N, Bollom A, Wolf JL, Lembo A. Complementary and alternative medicine use is prevalent among patients with gastrointestinal diseases. *Dig Dis Sci*. 2015;60(7):1883-1888. doi:10.1007/s10620-014-3498-3
 9. Vlioger AM, Blink M, Tromp E, Benninga MA. Use of complementary and alternative medicine by pediatric patients with functional and organic gastrointestinal diseases: results from a multicenter survey. *Pediatrics*. 2008;122(2):e446-451. doi:10.1542/peds.2008-0266
 10. Mahmoudpour Z, Shirafkan H, Mojahedi M, Gorji N, Mozaffarpour SA. Digesters in traditional Persian medicine. *Caspian J Intern Med*. 2018;9(1):1-6. doi:10.22088/cjim.9.1.1
 11. Zargarani A, Zarshenas MM, Karimi A, Yarmohammadi H, Borhani-Haghighi A. Management of stroke as described by Ibn Sina (Avicenna) in the Canon of Medicine. *Int J Cardiol*. 2013;169(4):233-237. doi:10.1016/j.ijcard.2013.08.115
 12. Rostami A, Minaii B, Rostamian A, Parsa Yekta Z, Aliasl J, Ahmadbegi S. Overview of avicenna (Ibn Sina) opinion on stomach swelling. *Iran Red Crescent Med J*. 2014;16(9):e21350. doi:10.5812/ircmj.21350
 13. Mahdavi JJ, Aliasl J, Ehsani MJ, Kamalinejad M, Gachkar L, Choopani R. Traditional Iranian medicine: the use of the Canon of medicine by Avicenna to treat ascites. *Eur J Integr Med*. 2015;7(6):674-678. doi:10.1016/j.eujim.2015.08.009
 14. Buranova DD. The value of Avicenna's heritage in development of modern integrative medicine in Uzbekistan. *Integr Med Res*. 2015;4(4):220-224. doi:10.1016/j.imr.2015.06.002
 15. Mahdizadeh S, Khaleghi Ghadiri M, Gorji A. Avicenna's Canon of Medicine: a review of analgesics and anti-inflammatory substances. *Avicenna J Phytomed*. 2015;5(3):182-202.
 16. Celik T. Time to remember Avicenna for his contribution to pulsology. *Int J Cardiol*. 2010;144(3):446; author reply 447-448. doi:10.1016/j.ijcard.2009.03.082
 17. Shoja MM, Rashidi MR, Tubbs RS, Etemadi J, Abbasnejad F, Agutter PS. Legacy of Avicenna and evidence-based medicine. *Int J Cardiol*. 2011;150(3):243-246. doi:10.1016/j.ijcard.2010.10.019
 18. Turgut O, Manduz S, Tandogan I. Avicenna: messages from a great pioneer of ancient medicine for modern cardiology. *Int J Cardiol*. 2010;145(2):222. doi:10.1016/j.ijcard.2009.05.015
 19. Shoja MM, Tubbs RS, Loukas M, Khalili M, Alakbarli F, Cohen-Gadol AA. Vasovagal syncope in the Canon of Avicenna: the first mention of carotid artery hypersensitivity. *Int J Cardiol*. 2009;134(3):297-301. doi:10.1016/j.ijcard.2009.02.035
 20. Mosavat SH, Marzban M, Bahrami M, Parvizi MM, Hajimonfarednejad M. Sexual headache from view point of Avicenna and traditional Persian medicine. *Neurol Sci*. 2017;38(1):193-196. doi:10.1007/s10072-016-2741-4
 21. Mahjour M, Khoushabi A, Miri Ghale Novi M, Feyzabadi Z. Food strategies of renal atrophy based on Avicenna and conventional medicine. *J Tradit Complement Med*. 2017;7(4):375-379. doi:10.1016/j.jtcme.2016.12.004
 22. Aciduman A, Arda B, Gunaydin A, Belen D. Laqve (wry mouth) considered in Avicenna's renowned treatise the Canon of Medicine. *Neurocirugia (Astur)*. 2008;19(3):267-271. doi:10.1016/s1130-1473(08)70232-x
 23. Nejabat M, Maleki B, Nimrouzi M, Mahbodi A, Salehi A. Avicenna and cataracts: a new analysis of contributions to diagnosis and treatment from the canon. *Iran Red Crescent Med J*. 2012;14(5):265-270.
 24. Atarzadeh F, Daneshfard B, Dastgheib L, Jaladat AM, Amin G. Early Description of Diet-Induced Blistering Skin Diseases in Medieval Persia: Avicenna's Point of View. *Skinmed*. 2016;14(5):367-370.
 25. Aghakhani N, Azami M, Ghomashlooyan M, Nikoonejad A. Time to appreciate Avicenna's knowledge of rabies. *Caspian J Intern Med*. 2017;8(1):63-64.
 26. Amin G. Popular Medicinal Plants of Iran. Tehran: Tehran University Press; 2005.
 27. Soltani A. Dictionary of Medicinal Plants. Tehran: Arjmand Press; 2004.
 28. Drossman DA, Hasler WL. Rome IV--functional GI disorders: disorders of gut-brain interaction. *Gastroenterology*. 2016;150(6):1257-1261. doi:10.1053/j.gastro.2016.03.035
 29. Ooi JL, Vardar R, Sifrim D. Supragastric belching. *Curr Opin Gastroenterol*. 2016;32(4):302-309. doi:10.1097/mog.0000000000000276
 30. Bredenoord AJ, Smout AJPM. Physiologic and pathologic belching. *Clin Gastroenterol Hepatol*. 2007;5(7):772-775. doi:10.1016/j.cgh.2007.02.018
 31. Lang IM. The physiology of eructation. *Dysphagia*. 2016;31(2):121-133. doi:10.1007/s00455-015-9674-6
 32. Sun X, Ke M, Wang Z. Clinical features and pathophysiology of belching disorders. *Int J Clin Exp Med*. 2015;8(11):21906-21914.
 33. Drossman DA. The functional gastrointestinal disorders and the Rome III process. *Gastroenterology*. 2006;130(5):1377-1390. doi:10.1053/j.gastro.2006.03.008
 34. Katzka DA. Simple office-based behavioral approach to patients with chronic belching. *Dis Esophagus*. 2013;26(6):570-573. doi:10.1111/dote.12006
 35. Kim HY, Bang BW, Kim CE. A psychiatric approach to a patient with excessive belching. *J Korean Neuropsychiatr Assoc*. 2014;53(5):327-331. doi:10.4306/jknpa.2014.53.5.327
 36. Disney B, Trudgill N. Managing a patient with excessive belching. *Frontline Gastroenterol*. 2014;5(2):79-83. doi:10.1136/flgastro-2013-100355
 37. Cigrang JA, Hunter CM, Peterson AL. Behavioral treatment of chronic belching due to aerophagia in a normal adult. *Behav Modif*. 2006;30(3):341-351. doi:10.1177/0145445504264746
 38. Avicenna H. Qanun fi al Tib [Canon of Medicine]. Beirut: Ehyaol Toras al-Arabi Press; 2010:88-96.
 39. Avicenna H. Qanun fi al Tib [Canon of Medicine]. Beirut: Ehyaol Toras al-Arabi Press; 2010:134-135.
 40. Alherawi M-i-Y. Sea of Jewelleries (Bahrol-Jawaher), Medical dictionary. Ghom: Jalalod-dinn; 1387.
 41. Chaichi Raghimi M, Eilkhani R, Khadem I, Latifi SAH. Eructation (Joshā') in the perspective of Iranian traditional

- medicine. *Journal of Islamic and Iranian Traditional Medicine*. 2017;8(1):105-116.
42. Nimrouzi M, Zarshenas MM. Holistic approach to functional constipation: perspective of traditional Persian medicine. *Chin J Integr Med*. 2019;25(11):867-872. doi:10.1007/s11655-015-2302-3
 43. Emtiazy M, Keshavarz M, Khodadoost M, et al. Relation between body humors and hypercholesterolemia: an Iranian traditional medicine perspective based on the teaching of Avicenna. *Iran Red Crescent Med J*. 2012;14(3):133-138.
 44. Choopani R, Mosaddegh M, Gir AA, Emtiazy M. Avicenna (Ibn Sina) aspect of atherosclerosis. *Int J Cardiol*. 2012;156(3):330. doi:10.1016/j.ijcard.2012.01.094
 45. Emtiazy M, Choopani R, Khodadoost M, Tansaz M, Nazem E. Atheroprotector role of the spleen based on the teaching of Avicenna (Ibn Sina). *Int J Cardiol*. 2013;167(1):26-28. doi:10.1016/j.ijcard.2012.06.020
 46. Avicenna H. *Qanun fi al Tib [Canon of Medicine]*. Beirut: Ehyaol Toras al-Arabi Press; 2010:105-106.
 47. Avicenna H. *Qanun fi al Tib [Canon of Medicine]*. Beirut: Ehyaol Toras al-Arabi Press; 2010:215-217.
 48. Avicenna H. *Qanun fi al Tib [Canon of Medicine]*. Beirut: Ehyaol Toras al-Arabi Press; 2010:143-146.
 49. Avicenna H. *Qanun fi al Tib [Canon of Medicine]*. Beirut: Ehyaol Toras al-Arabi Press; 2010:129-134.
 50. Rezaeizadeh H, Alizadeh M, Naseri M, Ardakani MRS. The traditional Iranian medicine point of view on health and disease. *Iran J Public Health*. 2009;38(Suppl 1):169-172.
 51. Avicenna H. *Qanun fi al Tib [Canon of Medicine]*. Beirut: Ehyaol Toras al-Arabi Press; 2010:96-108.
 52. Yosefi SS, Moradi-Kor N, Sadeghpour O, Jokar A, Askarfarashah M. New aspects to digestive process and importance of stomach as basic cause for disease. *Eur J Exp Biol*. 2014;4(3):209-210.
 53. Shirzad M, Mosaddegh M, Minaii B, Nikbakht Nasrabadi A, Ahmadian-Attari MM. The relationship between heart and stomach in Iranian traditional medicine: a new concept in cardiovascular disease management. *Int J Cardiol*. 2013;165(3):556-557. doi:10.1016/j.ijcard.2012.09.006
 54. Avicenna H. *Qanun fi al Tib [Canon of Medicine]*. Beirut: Ehyaol Toras al-Arabi Press; 2010:247-249.
 55. World Health Organization (WHO). *WHO Traditional Medicine Strategy: 2014-2023*. Geneva: WHO; 2015.
 56. Yazdian M, Agah S, Minaii B, et al. Evaluation of efficacy of Carum copticumseeds on gaseous symptoms in patients with abdominal bloating, a randomized clinical trial. *Int J Biosci*. 2014;5(9):372-378. doi:10.12692/ijb/5.9.372-378
 57. Boskabady MH, Alitaneh S, Alavinezhad A. Carum copticum L.: a herbal medicine with various pharmacological effects. *Biomed Res Int*. 2014;2014:569087. doi:10.1155/2014/569087

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