

# Relationship Between Cerebrospinal Fluid and Catarrh According to Avicenna

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## Abstract

**Context:** A postnasal drip (PND) or catarrh refers to the drainage of secretions from the paranasal sinuses or nose into the posterior nasal space and the oropharynx. A history of pharyngeal or postnasal mucus build-up may be at odds with the lack of other physical findings and the absence of systematic clinical data. The physiological basis and suitable treatments for PND have been insufficiently recorded in the medical literature. However, Iranian traditional medicine (ITM), which has a history of thousands of years, has discussed in detail the causes, origins, complications, and treatment of catarrh. Communication and cooperation between conventional and traditional medicine can lead to positive steps in solving the ambiguities related to catarrh. The present paper examines the origin of catarrh according to Avicenna and compares it with that described in conventional medicine.

**Evidence Acquisition:** In this study, we examined a major resource of ITM, the Qanoon fi al-teb (The Canon of medicine), by Avicenna and the writings of prominent ancient scholars and physicians on the origins of catarrh. PubMed and Google scholar were also searched for information on PND and catarrh, and they were compared with the catarrh in ITM.

**Results:** Physicians of ITM believe that the main substance in catarrh is discharged from the brain and that it is a connection between the brain and nasopharyngeal space. New scientific findings also confirm the relationship between cerebrospinal fluid (CSF) and catarrh, in common with that described by Avicenna thousands of years ago.

**Conclusions:** Catarrh is a serious condition and requires more investigation. It is hoped that a joint study of conventional and traditional medicine can elucidate different aspects of catarrh.

**Keywords:** Catarrh, Iranian Traditional Medicine, Avicenna, Postnasal Drip, Cerebrospinal Fluid

## 1. Context

A postnasal drip (PND) or catarrh refers to the drainage of secretions from the paranasal sinuses or nose into the posterior nasal space and the oropharynx (1-3). Chronic catarrh is commonly seen in primary care, but it often presents no problem to the clinician because a history of pharyngeal or postnasal mucus build-up may be at odds with the lack of other physical findings and the absence of systematic clinical data (2).

Postnasal drip syndrome (PNDS) has been explained in the literature of medicine for over 200 years. PNDS was first described by Dobell in 1866, although Frank pointed to "a form of chronic catarrh that its position is the pharynx" as early as 1794 (3, 4). PNDS was common in the U.K. in the 19th century and was so prevalent in the U.S. that it was named American catarrh. American chest physicians recognized

PNDS as the most common cause of chronic cough. However, in the U.K., chest physicians did not accept the relationship between PNDS and chronic cough, and they used the term rhinosinusitis instead of PNDS. In the U.S., the diagnosis of PNDS depended on a response to treatment with a decongestant and sedating antihistamines (3). In the U.K., physicians did not accept a therapeutic response as a diagnostic tool for PNDS (3). In 2006, the American chest physician Pratter introduced the term upper airway cough syndrome (UACS) to describe clinical symptoms not different from those of PNDS (5). However, the pathogenesis of UACS/ PNDS remains obscure, and physicians around the world have different definitions and treatments for this condition. The various proposed pathogeneses of UACS are as follows: the primary theory of postnasal drip then the chronic airway inflammation theory and a recent theory of

sensory neural hypersensitivity. In addition, some scholars suggest that UACS is a clinical phenotype of cough hypersensitivity syndrome (6).

Different conditions of the nose and throat may cause PND, but no definite cause can be identified in many cases (4). Clinically, the diagnosis of PNDS is vague and based on a medical history and examination, and it relies on the patient reporting a feeling of something dripping down the throat, in addition to symptoms of constant throat clearing, a globus sensation, and rhinorrhea (1, 2). Furthermore, the syndrome may overlap with chronic unexplained cough or even esophageal reflux (1, 2). The presence of mucoid or mucopurulent secretions of the nasopharynxes and oropharynxes or cobblestoning of the mucosa is also suggestive of this syndrome (1, 5).

While the general principles of UACS treatment are similar worldwide, the details of the treatment are different (6). The treatment of PND is often based on the presence of a specific disease. The therapies include avoidance of specific allergens, nasal steroids, antihistamines, gastroesophageal reflux therapy, treatment of concomitant infection, and correction of any associated sinonasal anatomical abnormalities. A common empiric therapy involves first-generation antihistamine/decongestant therapy, unless it is contraindicated (1, 4). A deeper investigation of patients with chronic catarrh is usually not conducted (2). The physiological basis for PND, in addition to suitable treatments, have been insufficiently recorded in the medical literature (4). In recent years, there has been a trend among patients in developed countries to turn to traditional medicine as the sole or complementary therapeutic option (7). The WHO defines traditional medicine as knowledge, skills, and practices based on the theories, beliefs, and indigenous experiences of different cultures used in the maintenance of health and in the prevention, diagnosis, improvement, or treatment of physical and mental illness. Traditional medicine covers a wide variety of therapies and practices, which vary from country to country and region to region (8). A critical reassessment of traditional sources of medical knowledge offers a post-modern approach to finding new solutions for old problems. Catarrh is carefully explained in Iranian traditional medicine (ITM).

### 1.1. History and Principles of ITM

The history of ancient Iran from the prehistoric era to 637 AD returns to about 10000 years ago, and the advancement of medicinal science was particularly considerable (9). Medical sciences flourished in Iran throughout the medieval period (10). Prominent medieval scientists, such as Razi (Rhazes; 865 - 925 AD), Ali Ebn Abbas (Haly Abbas; 949 -

982 AD), Ibn Sina (Avicenna; 980-1037 AD), and Jorjani (Sorsanus; 1042-1137 AD), significantly influenced the development of Iranian medical science (11-13). Ibn Sina (Avicenna), the great physician and philosopher who played a major role in the development of medieval medicine, was born in Afshaneh in the northwest of old Persia. He was already a physician at the age of 16. He was also proficient in other branches of science, such as astronomy and philosophy. More than 400 books and treatises, most of them in field of medicine, are written by Ibn Sina. His masterpiece, The canon of medicine, was studied by European scholars until the 17<sup>th</sup> century AD (7).

ITM is based on four humors (khelt in the Persian language): dam or blood (possessing hot and wet qualities), balgham or phlegm (possessing cold and wet qualities), safra or yellow bile (possessing hot and dry qualities), and sauda or black bile (possessing cold and dry qualities). Every humor is a matter produced from the transformation of foodstuff in the digestive system. From the perspective of ITM, health depends on the balance of these humors, and an abnormality or imbalance of these humors can lead to illness (14, 15).

ITM has its own view on catarrh, as well as a particular classification system and management strategy. Communication and cooperation between conventional and traditional medicine can help us take positive steps toward solving the ambiguities related to catarrh. The present paper examines the origin of catarrh according to Avicenna and compares it with that of conventional medicine.

## 2. Evidence Acquisition

This study was based on a literature research of the major reference of ITM, Qanoon fi al-teb (The canon of medicine), written by Avicenna in 1025 CE. This book was determined as Iranian traditional reference in medicine and pharmacy. Today, it is used as a reference for the Iranian PhD program in traditional pharmacy. Two words nazleh and zokam in this book were searched. In order to make the relationships between traditional data and new findings, a search was performed using the PubMed and Google Scholar databases, 20 articles from 2006 - 2015 for information on PND and catarrh.

## 3. Results

### 3.1. Avicenna and Catarrh

Catarrh has been allocated a chapter in most medieval medical texts of Persia. Ibn Sina (Avicenna) devoted a chapter to catarrh and coryza in the second volume of The Canon of Medicine in the section on head diseases. Ibn

Sina divided catarrh into two types. One type was a discharge from the nasal passages called coryza (zokam), and the other descended down the back of the throat (pharynx) and was called catarrh (nazleh). According to Ibn Sina, they had a common cause, with the discharge originating in the brain and culminating in the nasopharynx. The scholar classified catarrh as warm and cold, and each type of catarrh had a specific clinical manifestation. Warm catarrh symptoms were redness of the eyes and face and yellow and dilute discharges that induced a burning sensation in the nose and throat. Cold catarrh symptoms were tension and heaviness in the head, face, and forehead; a thick whitish discharge; roughness of the tongue; a discharge, with a cold and unpleasant nature; heaviness of the senses; malaise that improved after consuming foods of a warm temperament; nasal stuffiness; and loss of the sense of smell (16).

From the perspective of physicians of traditional medicine, catarrh caused various diseases, such as otitis, gastric ulcers, intestinal ulcers, diarrhea with a gastric origin, coughs, pneumonia, pleurisy, and joint diseases (16-18).

Ibn Sina believed that one cause of catarrh was a brain cell disorder. The scholar stated: The weakness of the brain means that it is not capable of using nutrients produced from the digestion of food in the liver. It is transferred to the brain and excreted to the inferior tract of the brain as catarrh. Ibn Sina believed that the main substance in catarrh was discharged from the brain and that it was a connection of the brain and nasopharyngeal space (16).

Ibn Sina's comments about catarrh match the new scientific findings about the formation of the cerebrospinal fluid (CSF) and the discovered communication between the brain and sinuses. It can be said that normally, after metabolism in all cells of the body and brain cells, some gases and metabolites derived from metabolism enter the brain through the bloodstream. Some gases in the blood vessels in the brain pass through the blood-brain barrier, and some gases and metabolites pass through the choroidal capillary network located in the upper wall of the brain ventricles. Some metabolites of the brain cells reach the lateral ventricles of the brain and participate in the formation of CSF. The CSF enters the third ventricle through the Monroe foramen and mixes with fluid from the choroid plexus of the third ventricle. It then enters the fourth ventricle through the Sylvius duct and exits to the subarachnoid space through two lateral Luschka foramina and a single midline Magendi foramen. Some CSF enters the sagittal veins of the brain and bloodstream through the arachnoid villi (19, 20). Other components of the CSF enter the cranial sinuses through the lymphatic vessels (glymphatic) of the upper wall of the sinus. They then mix

with the secretions of epithelial cells lining the sinuses and are discharged into the nasopharyngeal space (21-23).

Cranial sinuses (sphenoidal, posterior, and anterior ethmoidal, frontal, and maxillary) drain into the superior concha, superior meatus, and middle meatus (24). If the body temperature rises, for example, during exercise or as a result of eating a food with a warm temperament, exposure to heat, or entry of microorganisms in the body, the cellular metabolism of all the body cells, including brain cells, increases (25). More CSF is consequently produced and exits from the brain through the pathway described above. If the reason for the increase in body temperature is abnormal, such as a microorganism, metabolites become abnormal and the body identifies them as an antigen (26). As a result, the fluid entering the sinuses increases. This fluid also contains antigens, which stimulate the epithelial cells lining the sinuses, further increasing the level of secretions. This fluid is discharged into the lower sinuses, thereby stimulating these areas. Some antigens enter the bloodstream through the sagittal veins of the brain and spread throughout the body to various areas, such as joints, and cause antigen-antibody inflammatory reactions (27).

According to some ITM resources, catarrh can cause other diseases if it spreads to another organ (28). This can occur, for example, via the Eustachian tube, which opens into the lateral wall of the nasopharynx. Catarrh can enter the ear through this pathway and cause ear diseases (29). The lacrimal duct of the eye opens into the inferior concha, providing a pathway for eye diseases (24). Catarrh can also enter the esophagus, stomach, and small and large intestines through the pharynx and cause gastric and intestinal ulcers and diarrhea of gastric origin (30). Catarrh entering the trachea, bronchi, and lungs through the nasopharynx can cause cough, pneumonia, and pleurisy (31).

#### 4. Conclusions

In conclusion, this study showed that from the perspective of conventional medicine, PND and catarrh are the result of the drainage of secretions from the paranasal sinuses or nose into the posterior nasal space and the oropharynx. Allergens or any abnormal factors in contact with the sinuses and nasal epithelial cells are thought to increase the discharge of these cells and cause sinusitis, rhinitis, rhinosinusitis, and coughs. In contrast, physicians of ITM believed that the brain was the major point of origin of catarrh and it is beyond a simple epithelial cell discharge. Although the discharge of these cells was considered a component of catarrh, they believed that the main component was derived from whole-body metabolic processes. The metabolites were related to sinus epithelial

cells and produced reactions throughout the body. What-ever affects the body metabolism can create catarrh. This included nutrition, physical activity, weather, sleep and wakefulness, neuronal responses, and pathogens. Attention to these health-related issues can help improve or prevent catarrh.

Catarrh is pervasive and requires more investigation. Catarrh can cause gastrointestinal and joint diseases and other conditions. It may be useful to examine the possible role of catarrh in these conditions and treat both if they are found to be associated. It is hoped that a joint study of conventional and traditional medicine can elucidate different aspects of catarrh.

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## Footnote

**Authors' Contribution:** Study concept and design, Shahpar Kaveh; acquisition of data, Shahpar Kaveh; analysis and interpretation of data, Shahpar Kaveh; drafting of the manuscript, Shahpar Kaveh, Sohrab Dehghan, and Narges Kaveh; critical revision of the manuscript for important intellectual content, Rasool Choopani, Saeed Sadr, and Shahpar Kaveh; statistical analysis and administrative; technical, and material support, Mahmoud Mosaddegh; study supervision, Rasool Choopani and Saeed Sadr.

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