



The Respiratory Reflex of Cough: A Comparative Study of Contemporary Medicine and *Unani* Concepts

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Abstract

Cough suddenly and frequently helps to remove mucus, irritants, foreign substances, and bacteria from the airways. It can be a symptom of a respiratory infection like the common cold, bronchitis, tuberculosis, influenza, smoking, or other health issues. Contemporary texts describe several kinds of coughs, including acute, chronic, and subacute coughs, coughs that produce or do not produce mucus, and specific types like Reflex cough, voluntary cough, and evoked cough. In Unani texts, cough is referred to as diseases rather than symptoms. It is also called as "*Sual*" in Arabic, "*Surfa*" in Persian, *khansi* in Hindi, and cough in English. In Unani medicine, *Sual* is attributed to three causes: *Ashab-e-badiya* (extrinsic factor), *Asbab-i- Wassila* (intrinsic factor), and *Iltehab* (inflammation). The primary categories of *Sual* identified in *Unani* texts are *Sual yabis* and *Sual Ratab*, which are further subdivided into various types. This paper examines the concept, causes, types, and treatment approaches to *Sual*/Cough as described in both classical and modern literature.

Keywords: Cough, *Sual*, *Surfa*, Modern concept Unani literature, *sual yabis*, *sual ratab*.

Introduction:

One of the most vital processes in human biology is respiration, which allows carbon dioxide (CO₂) to be released and oxygen to be taken in. Without breathing, life is unimaginable¹. From the moment of first breath, breathing is a lifelong process. The most common sign of respiratory disorders is coughing. Cough is not always a sign of aberrant clinical condition². It is one of the tools in the lung defence arsenal³. According to its definition, "A cough (Latin: Tussive) is an abrupt and violent exhalation of air from the lungs brought on by an unconscious tightening of the muscles that regulates breathing"⁴. It is a crucial defence mechanism against respiratory pathogens and aids in the removal of mucus, foreign particles, pathogens, liquid buildup, inflammation, inflammation-related mediators, and noxious aerosols from the tracheobronchial tree^{2,5}.

Coughing involves three phases:

- I. A relaxation of the diaphragm (i.e. movement up and dome-shaped),

- II. A sharp contraction of the muscles of expiration,

- III. Closure of the glottis.

Consequently, there is a significant increase in lung pressure even though the glottis closes, preventing the air from leaving the lungs, despite the lungs being severely compressed³.

Epidemiology:⁶

Worldwide, lung illnesses are projected to rank as the third leading cause of mortality and the fifth leading cause of disability. Cough and phlegm are key signs of lung illness in the general population. In India, long-term lung diseases were believed to be responsible for 7% of fatalities and 3% of Disability-Adjusted Life Years (DALYs) that were lost. The frequency of cough in India ranges from 5% to 10%.

Common causes of cough:^{2,5,7}

- I. Acute infections - pneumonia, pertussis etc.

- II. Chronic infections – Bronchiectasis, Cystic fibrosis, Recurrent aspiration, tuberculosis etc.
- III. Post infectious cough – Mycoplasma pneumonia, Bordetella pertussis etc.
- IV. Chronic upper airway syndrome
- V. Lower airway diseases – bronchial asthma and Chronic Obstructive Pulmonary Disease (COPD).
- VI. Foreign bodies (including aspiration and endobronchial sutures).
- VII. GERD – Gastro Oesophageal Reflux Disease
- VIII. Drugs: ACE (Angiotensin Converting Enzyme) Inhibitors.
- IX. Habitual and psychogenic cough.
- X. Tonsillar enlargement
- XI. Tobacco smoke, air pollution and occupational exposure.

Mechanism:⁸

Coughing can begin either on its own or as a natural response. When it serves as a defence mechanism, it involves two main types of nerve pathways: the afferent and efferent pathways. The afferent pathway is composed of nerve receptors that stretch across the sensory areas of the trigeminal, glossopharyngeal, superior laryngeal, and vagus nerves. On the other hand, the efferent pathway consists of the recurrent laryngeal nerve and the spinal nerves. The sequence that leads to a cough begins with a deep breath, followed by the closing of the vocal cords, the lowering of the diaphragm, and the contraction of muscles against a closed vocal cord. This significantly increases the pressure in the thoracic area, which in turn, makes the trachea narrower. After the vocal cords open, the large pressure difference between the airways and the surrounding air, combined with the narrowing of the trachea, leads to fast air flow through the trachea. The friction that results from this helps to remove mucus and other foreign substances.

Classification:

The American College of Chest Physicians (CHEST) has recently released a guideline that categorizes coughs into three distinct groups: acute, subacute, and chronic. This classification system is believed to be instrumental in both the diagnosis and treatment of coughs².

- I. Acute Cough: An acute cough is defined as one that lasts for a maximum duration of three weeks. It is typically caused by infections of the upper respiratory tract, acute bronchitis, or tracheobronchitis, often due to bacterial or viral infections. Acute coughs, when caused by an infection, usually resolve on their own, with patients recovering within one to two weeks as the infection is cleared from the body^{2,5,8,9}.
- II. Subacute Cough: A subacute cough is characterized by its duration, lasting between three to eight weeks. The causes of subacute coughs include

gastroesophageal reflux, aspiration, and bronchial asthma^{2,5,8,9}.

- III. Chronic and Persistent Cough: A cough that persists for more than eight weeks is classified as chronic. The most common causes of chronic cough in most patients are upper respiratory tract cough syndrome, asthma, and gastroesophageal reflux disease (GERD)^{2,5,7,8,9}.

Historically, coughs were also classified as either productive (producing mucus or phlegm) or non-productive (dry). A productive cough is one where significant mucus from the bronchial tree is expelled during coughing. Conversely, a non-productive cough, also known as a dry cough, does not expel any mucus. It is important to note that suppressing a productive cough with medication is generally not recommended, as it can lead to an excessive buildup of mucus. However, suppressing a non-productive cough with cough suppressants, known as antitussives, is considered appropriate^{2,10,11}.

As per the central mechanism, there are an additional three categories of coughs.

- I. Category 1: Involuntary cough
- II. Category 2: Purposeful cough (Voluntary cough)
- III. Category 3: Cough triggered by the desire to cough (evoked cough)¹².

Unani concept:

The *Unani* medical tradition adopts a comprehensive approach to healthcare, tackling a broad range of health issues and illnesses. It provides thorough remedies for various diseases affecting different body systems. Within *Unani medicine*, there are several types of drugs, including *Munaffis-i-balgham* (expectorants), *Mulattif* (demulcent), *mulayyin-i-sadr* (emollient of the chest), *Muhallil-i-warm* (anti-inflammatory). This varied collection of medicines stands out for its success in treating a wide variety of respiratory conditions. Patients with conditions like *Sual* (Cough), *Nazla-o-Zukam* (acute coryza and catarrh), *Diq al-Nafas* (bronchial asthma), and others, find relief in the extensive range of treatments and remedies available in the *Unani* system, showcasing its ability to address a wide range of respiratory problems.

SUAL/ SURFA:

According to scholars of *Unani* medicine, *Sual*, also known as Cough, represents an action performed by the internal power of the body, known as *Tabiyat*, in the process of expelling irritants from the lungs and surrounding structures¹³.

This action is analogous to the process of sneezing and vomiting, which is to the brain and stomach what coughing is to the lungs¹⁴.

Numerous *Unani* scholars have delineated this symptom as *Surfa* within their classical texts. The term *Sual* is of Arabic origin, and it is referred to as *Surfa* in the Persian language and *Khansi* in the Hindi language^{13,15,16}.

Many ancient physicians have described different types of *Sual* in different Unani classical texts. For eg:

- A. According to *Hkm. Gulam Jeelani Khan* in *Makhzanul Ilaj*, there are 14 types of *Sual* on the basis of causes¹⁷
 - I. *Sual Nazlī*- acute catarrhal cough
 - II. *Sual Waramī*- Cough due to inflammation
 - III. *Sual Bārid*- Cough due to cold
 - IV. *Sual Ruṭūbī ya Balghami*- cough due to moistness on the lungs
 - V. *Sual Yubsī*- cough due to dryness on the lungs
 - VI. *Sual Damawī*- cough with reddish sputum
 - VII. *Sual Ṣafrāwī*- cough with yellowish sputum
 - VIII. *Sual Sawdāwī*- A morbid state characterized by pain of side of chest, dry cough in initial stages and blackish expectoration in later stages
 - IX. *Sual Wabā'ī*- epidemic cough
 - X. *Sual Khashofi* – Cough due to roughness of trachea
 - XI. *Sual Buthūri*- A morbid state characterized by eruptions in throat
 - XII. *Sual Shirkī*- Cough due to secondary causes
 - XIII. *Su'āl-i-Atfāl*- children's cough
 - XIV. *Sual Ḍiqi*- *Sual* due to tubercular fever

B. According to *Hkm. Kabiruddin* in *Al Akseer*, there six types of coughs:¹⁸

- i. Surfa due to *Sū'-i-Mizāj Hār Sāda* (Cough due to simple morbid hot temperament)
- ii. Surfa due to *Sū'-i-Mizāj Bārid Sāda* (Cough due to simple morbid cold temperament)
- iii. Surfa due to *Sū'-i-Mizāj Hār Māddī* (Cough due to morbid hot temperament with substance)
- iv. Surfa due to *Sū'-i-Mizāj Bārid Māddī*, which also known as *Tar khansi* (productive cough) (Cough due to morbid cold temperament with substance)
- v. Surfa due to *Waram* or *Tafarruq-i-Ittiṣāl* of respiratory track (Cough due to inflammation or injury of respiratory track)
- vi. Surfa due to *Qarḥa* (cough due to respiratory ulcer)

C. According to *Hkm. Kabiruddin* in *Qanooncha*, there is two types of *Sual*:¹⁹

1. *Su'āl Yābis*
2. *Su'āl Ratab*.

1. *Su'āl Yābis or Surfa Khushk* (dry cough):

Cough caused due to *Sū'-i-Mizāj Sāda* may be of two types, (*Su-i-mizaj* – abnormal temperament/ impaired temperament)

- a) *Sū'-i-Mizāj Hār Sāda* (simple altered hot temperament)

- b) *Sū'-i-Mizāj Bārid Sāda* (simple altered cold temperament)

These are referred to as *Surfa Khushk* or dry cough. *Surfa Yābis*, which is also known as dry cough, can be simply described as a cough that does not produce any sputum. *Majusi*, in his book *Kāmil-us-Sanā 'a*, discusses *Surfa Yābis* in which the patient does not cough up any phlegm^{16,18,20}.

2. *Su'āl Ratab or Surfa Tar* (Productive cough):

Cough caused due to *Su-i-Mizāj Māddi* can be of two types:

- a) *Su-i-Mizāj Hār Māddi* (altered hot temperament with humoral)
- b) *Sū'-i-Mizāj Bārid Māddi* (altered hot temperament with humoral)

These are referred to as *Surfa Tar* or productive cough^{16,18}.

Should it be a *Su-i-Mizāj Hār Māddi* cough, it would also be considered productive¹⁸.

Individuals with a *Balghamī Mizāj* temperament are more prone to developing a cough.

D. The intensity of a cough is categorized into two types: *Surfa Hād* (acute cough) and *Surfa Muzmin* (chronic cough). A chronic cough is characterized by the accumulation of mucus in the lungs, which is difficult to expel.²¹

E. According to Dr and *Hkm. Hari Chand Multani* and *Hkm. Mohd. Hassan Qurshi* in *Taj-ul-Hikmat* and *Jami-ul-Hikmat*, there are 8 types of *Sual*:^{22,23}

- I. *Balghamī khansi*- phlegmatic cough
- II. *Sardi ki khansi* - Cough due to cold
- III. *Khuskh khansi*- dry cough
- IV. *Purani khansi* – chronic cough
- V. *Shadeed khansi* – continuous cough
- VI. *Kali khansi*- whooping cough
- VII. *Nazla ki khansi* - acute catarrhal cough
- VIII. *Diq ki khansi* - *Sual* due to tubercular fever

Many ancient physicians have described different causes of *Sual* in different Unani classical texts. For eg:

A. *Ismail Jurjani* (*Zakhīra-i Khwārazmshāhi*); *Abdul Mansoor Al Hasan Al Qamari* (*Ghina Mina*); and *Hkm. Kabiruddin* (*Al Akseer*) have identified three primary causes of cough, namely:

1. *Asbab Badiya* (extrinsic factors) i.e. smoke, dust, fumes, cold air, hot and spicy foods etc.
2. *Asbab-e-waasila* (intrinsic factors) i.e. *su-e-mizaj* (derangement of temperament) either *sada* or *maddi* (simple or substantial) etc.
3. *Iltehab* (Inflammation) in the lungs^{16,18,24}.

- B. According to the *Abul Hasan Ahmad bin Mohammad Tabri*, something that happens inappropriately in the lungs is called a cough. According to him, there are five causes of cough,²⁵
- I. Dryness of trachea
 - II. Morbid substances that accumulate inside the lungs
 - III. Any type of inflammation or edema formation within the lungs
 - IV. Altered temperament of blood to hot and dry due to hepatic fever
 - V. Inflammation or edema of the liver
- C. *Su'āl* can be associated with coryza, nasal irritation, fever (occasional) etc. The specific causative factors of cough are *Asbāb Hārā* (hot factors) and *Asbāb Bārīda* (cold factors)^{16,18,21}.

Dalā'il wa' Alamat (sign and symptoms): ^{18,21-23}

- I. For a patient of *Sū'-i-Mizāj Hār Sāda*, feeling thirsty and having a dry throat.
- II. For a patient of *Sū'-i-Mizāj Bārīd Sāda*, feeling thirsty is not a symptom, but cold air and cold water can actually make the cough worse.
- III. In the case of severe cough during *Imtilā'-i-mi'da*, the involvement of the stomach should be considered.
- IV. Frequent Coughing: A persistent or repetitive urge to cough.
- V. Mucus Production: In a productive cough, there may be mucus, which can vary in color (clear, white, yellow, green) or may contain blood.
- VI. Chest Pain/Discomfort: Frequent or severe coughing can cause chest pain, soreness, or a feeling of tightness in the chest muscles.
- VII. Sore Throat: Continuous coughing can irritate the throat, causing inflammation, dryness, or pain.
- VIII. Hoarseness: Strain on the vocal cords due to coughing can result in a hoarse or raspy voice.
- IX. Shortness of Breath: Difficulty breathing or a sensation of breathlessness, especially after prolonged bouts of coughing.
- X. Wheezing: A high-pitched whistling sound when breathing, often linked with asthma or bronchitis.
- XI. Fatigue: Persistent coughing can lead to physical exhaustion, especially when it disrupts sleep.

Associated Symptoms Based on Cause: ^{26,27}

- I. Fever and Chills: If the cough is caused by an infection, such as pneumonia or the flu, fever may accompany the cough.
- II. Postnasal Drip: Coughing due to mucus dripping down the throat, commonly associated with colds, allergies, or sinus infections.
- III. Heartburn or Acid Reflux: In the case of gastroesophageal reflux disease (GERD), acid from

the stomach can cause coughing, especially when lying down.

- IV. Coughing up Blood (Hemoptysis): May indicate a more serious condition, such as tuberculosis, lung cancer, or pulmonary embolism.

Usūl-i 'Ilāj (Principles of treatment): ^{17,28}

The principle of cough is mentioned as following:

- I. *Ta dil-i Su-i Mizaj*: Correction of morbid temperament, can be achieved through various methods such as *Taltif* (rarefaction), *Taskhīn* (warming), *Tartib* (moistening), *Tajfif wa Tanshif* (drying), or *Taghriya* (soothing), as needed.
- II. *Tanqiya*: The removal of harmful substances should be undertaken.
- III. *Taskin-i-Sual*: Monitoring of the cough is necessary.
- IV. Prevention of the underlying cause is essential.

Discussion:

Sual or cough is explained in both systems of medicine i.e. Unani and modern system of medicine as a reflex or a protective mechanism which protects the respiratory system from irritants or pathogens entering the respiratory tract which can be cause of a disease or diseases. When cough is explained as a symptom in modern concept why is it that it is described as a disease in Unani system of medicine?

The primary reason for mentioning *sual* as a disease is because:

- I. Sual or cough not only involves respiratory system but also involves the other organs.
- II. The derangement of mizaj or temperament, a concept of Unani system of medicine, alters the functions of other organ including the respiratory system can lead to cough when there is no other pathogens or irritants entering the respiratory tract.
- III. Sual may affect other other organs, or it may be due to organs like stomach, liver, spleen etc., (*Ibn Sina 1411 H; Arzani, 1903*)

The other reason for calling it as a disease in the unani literature is its therapeutic approach. In the protocol for treatment of cough it is also important that the treatment is not symptomatic. It has a broad approach that it is focused not only in decreasing the cough bouts but also taking care of the other systems which has affected due to cough there by making the therapeutic approach broader and more effective and protective for all organs and their functions including the respiratory system.

Conclusion:

The treatment of a disease is mostly based on its therapeutic approach. The broader the therapeutic approach is the better the results. There by mentioning *sual* as disease makes the therapeutic approach broader than making it only as a symptom. Such approaches not only help in treating cough but also protecting not only

the respiratory system but also protecting and strengthening the other organs and its functions.

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