

## FEATURES OF DIAGNOSIS AND TREATMENT OF PSYCHOGENIC (SOMATIC, PSYCHOSOMATIC) COUGH IN CHILDREN

Boyarchuk, Oksana<sup>1</sup>; Chornomydz, Iryna<sup>1</sup>; Chornomydz, Andrii<sup>2\*</sup>; Mudryk, Uliana<sup>1</sup>; Mochulska, Oksana<sup>1</sup>

<sup>1</sup>Department of Children's Diseases and Pediatric Surgery, I. Horbachevsky Ternopil National Medical University, Ternopil, Ukraine

<sup>2</sup>Department of Pharmacology and Clinical Pharmacology, I. Horbachevsky Ternopil National Medical University, Ternopil, Ukraine

[\\*chornomydz@tdmu.edu.ua](mailto:chornomydz@tdmu.edu.ua)

### Abstract

Psychogenic (somatic) cough remains an important medical problem today, the true prevalence of which stays uncertain today. This is primarily due to the lack of patients seeking medical care, erroneous (or deliberate) doctors making another diagnosis due to the reluctance of health professionals to continue the diagnostic search, or lack of information about this pathological condition. When diagnosing this type of cough, it is necessary, in addition to excluding organic pathology, to pay special attention to the presence of the patient's psychological preconditions for the development of this symptom.

The literature review describes the main problems of development, distribution, clinic, and diagnosis of psychogenic (somatic cough). Special attention is paid to the methods of treatment of this disease. It is established that despite the insufficient evidence base, methods of psychological impact on the patient and elimination of both the causes of cough and the actual symptom are considered the basis for the treatment of this disease. Therefore, knowledge about the causes of development, features of the clinical course, and treatment of psychogenic cough is important today for doctors of any specialty, especially for family physicians, pulmonologists, pediatricians, neurologists, and psychiatrists.

**Keywords:** *psychogenic cough, somatic cough, tic cough, diagnosis and treatment of cough in children*

## Introduction

Cough is one of the most common and important symptoms of childhood diseases [1]. Cough is a very complex reflex mechanism aimed at restoring airway patency. The mechanism of cough development is associated with irritation of vagus nerve receptors in the area of reflexogenic zones (laryngeal mucosa, tracheal bifurcation, large bronchi). Cold or dry air, pungent odors, sputum, nasal secretions, viruses, bacteria, foreign bodies, etc. can act as stimuli of cough receptors [2]. Cough occurs when exposed to mechanical, physical, and chemical stimuli (fluctuations in temperature and humidity, air pollutants, tobacco smoke, nasal mucus, sputum, etc.) on "fast" (irritant) receptors and inflammatory mediators (prostaglandins, bradykinin, substance P and others) - on "slow" C-receptors [3]. In addition, cough can be caused by irritation of receptors located in the area of the external auditory canal, the mucous membrane of the paranasal sinuses and pharynx, the pleura, peritoneum, diaphragm, pericardium, etc. [2, 4, 5]. Single coughing fits are physiological and are aimed at removing mucus from the larynx. Healthy children cough an average of 10-15 times a day, more often in the morning.

The most common causes of non-physiological cough are diseases of the respiratory system, in which it is one of the first and most important symptoms. In pediatrics, the vast majority of cases of coughing are associated with acute and chronic respiratory diseases, caused mainly by respiratory infections in the upper and lower respiratory tract, as well as allergic pathology [1, 2].

There are many causes of cough in children, which are associated with airway lesions, among which the most common are [3, 6]:

- infectious-inflammatory process in the upper respiratory tract (acute respiratory viral infections, sore throat, pharyngitis, sinusitis, exacerbation of tonsillitis, laryngitis);
- infectious-inflammatory process in the lower respiratory tract (laryngotracheitis, tracheitis, bronchitis, pneumonia);
- irritative inflammation of the mucous membranes of the respiratory tract;

- allergic inflammation of the mucous membranes of the respiratory tract;
- bronchospasm;
- airway obstruction by viscous bronchial secretions, aspiration by foreign bodies, fluids, endogenous and exogenous formations, etc.;
- swelling of the lung parenchyma;
- other factors [3].

Many different causes are not associated with direct damage to the respiratory tract (psychogenic cough, cardiovascular disease, digestive system, drug reactions, etc.) [1].

Cough is classified in pediatrics into acute (less than 2 weeks), subacute (2 - 4 weeks), and chronic (more than 4 weeks) [7, 8]. Chronic cough can be a huge social and economic loss for some patients [2-4]. In addition, chronic cough in children can cause anxiety and social discomfort [9].

According to many authors, the most common causes of chronic cough in children are postnasal Drip syndrome, gastroesophageal reflux, chronic bronchitis, bronchial hyperreactivity (bronchial asthma) [3, 7, 8, 10]. At the same time, almost a quarter of those surveyed had two causes of cough, and 3% had three causes [11]. It is estimated that about 46% of patients with chronic cough have unknown causes, despite a large number of studies and long-term treatment [7, 9] and careful examination of which reveals no objective changes in the internal organs [12]. In many cases, not only parents but also the doctor does not suspect the possibility of linking cough with disorders of the psycho-emotional sphere of the child [12].

## Terminology

To date, there is no unequivocal opinion in the scientific literature on the terminology of psychogenic cough. Historically, psychogenic cough is also called "barking cough" [13], psychogenic tick cough [14], operant cough, nervous cough, psychogenic habitual cough [15, 16], "barking cough of puberty" [17], "simulant cough" and others. Many researchers combine all these concepts under one term "psychogenic cough" [7, 9, 18], which in our opinion is not entirely true. However, according to these researchers, all these types of cough have common features: the symptom, which has no obvious medical etiology, is resistant to drug

treatment and is considered psychiatric or psychological [18]. In the early literature, the chronic cough was considered psychogenic if it persisted despite medical treatment, had characteristics such as clear ringing or barking, was absent during sleep, or was associated with mental illness [19]. There is a general opinion in the literature that the diagnosis of psychogenic or habitual cough is a diagnosis of exclusion and involves an inorganic etiology [18]. At the same time, after a thorough diagnostic search, there is no reason for its appearance and the presence of some emotional component or stress factors is documented [7, 20]. This cough is persistent and interferes with normal activities, can interfere with personal and social relationships, and disrupt learning and work [15, 21].

As noted by Irwin S. and co-authors [18], often in the terminology of psychogenic cough there is confusion:

- (1) habitual cough is sometimes identified with psychogenic cough;
- (2) habitual cough is sometimes distinguished from psychogenic;
- (3) habitual cough is called "nervous tic";
- (4) psychogenic cough is called a conversion disorder or "criminal cough", etc.

More common in the literature is the selection of terms from the general cohort of two types of cough: "psychogenic" and "habitual or tic". This is more appropriate given the various causes of these types of cough and the psychological color of this symptom. Changes in terminology have also taken place in view of the new edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) [22]. However, none of the common terms that were used to denote psychogenic cough didn't appear in this manual. The closest term that can be used to describe this type of cough is "somatic cough disorder", formerly known as "somatization disorder". The DSM-5 defines it as "characterized by somatic symptoms that are either very disturbing or lead to significant dysfunction, as well as excessive and disproportionate thoughts, feelings, and behaviors about these symptoms. This is usually a diagnosis of exclusion, which should be established after a thorough and thorough examination [7, 17]. Instead of the term "habitual cough", it is recommended to use the term "tic cough"<sup>4</sup>. When

organic pathology is ruled out, there is still confusion between two concepts: somatic cough disorder and vocal tics (as manifested in Tourette's syndrome) [7, 17, 23].

In our opinion, there are 3 types of cough: psychogenic (somatic), habitual, and tic in connection with some features such as clinical symptoms, causes, and mental state of patients, which we will describe in the following sections.

### Spread

To date, there is virtually no data in the world literature that could indicate the frequency of psychogenic (somatic) cough, especially among children [7]. Pediatricians and other researchers suggest that many cases of psychogenic cough are misdiagnosed [15].

The main errors in the diagnosis of psychogenic cough are:

- Hyperdiagnosis due to insufficient diagnostic search
- Presence of rare causes of cough that have not been diagnosed in a child
- Presence of external causes of cough (passive smoking, unfavorable environmental situation), which are not taken into account
- No diagnosis at all and the doctor indicates no pathology in the child.

In some cases, the reason for the lack of a real picture of the spread of psychogenic cough is the lack of help, or erroneous (or intentional) doctors to make another diagnosis (SARS, chronic bronchitis, postnasal drip syndrome, etc.) due to the reluctance of health professionals to continue the diagnostic search.

Kravitz et al. [14] reported that in most of the cases they considered, the diagnosis was delayed for several weeks and several months because doctors simply did not know about the psychogenic cough syndrome [15].

According to the available literature, psychogenic cough is diagnosed in approximately 3–10% of children with chronic cough of unknown origin [7, 17, 18]. However, a Chinese systematic review and meta-analysis conducted by Wei et al. [11] in 2016, reported the overall prevalence of psychogenic

cough as 3.02% [17]. Hollinger and colleagues, reported somatic cough (psychogenic) as the second cause of chronic cough in children aged 6 to 16 years [7, 9].

As for tic cough, its prevalence among children is unknown. Although the overall prevalence of tic disorders is in the range of 4 to 24% among primary school children. A prospective study in Sweden [24], which was the first and almost the only one, found that the prevalence of chronic vocal tics (including cough) was 0.3% in girls and 0.7% in boys among children aged 7 to 15 years [18]. Tourette's syndrome, which is now recognized as a relatively common disorder, has a prevalence of about 5 to 30 per 10,000 children, or about 1 per 1,000 male children, and 1 per 10,000 female [18].

The diagnosis of psychogenic cough is usually made among the pediatric and adolescent populations and is rare in adults [7, 8, 18]. It has been reported that more than 90% of cases of somatic (psychogenic) cough occur before the age of 18 years. Among children, no significant difference in prevalence among girls and boys was found, and women predominate in adulthood [7, 10].

### Causes

To date, there are quite many reasons for the development of psychogenic cough. According to the predominant etiological factors, psychogenic cough is divided into three types:

1) **cough-habit (habitual cough)**, which occurs after a severe lung disease. With its help, the child causes sympathy in others, and the conscious simulation is reflexively fixed in a brain.

2) **signal cough** - occurs on a nervous basis. With its help, the child tries to attract the attention of others or to achieve a certain goal.

3) **cough, as a manifestation of nervous tic (tic cough)**, which occurs after emotional stress, overload. This type of cough differs from the previous ones in that the child, on the contrary, tries to hide it, feels awkward when it appears, which leads to additional mental experiences.

**Cough-habit.** Many researchers report that this type of psychogenic cough usually occurs after a

respiratory illness in which the patient has a reactive cough [16, 25]. When the symptoms of the underlying disease subside, the patient continues to cough. It is hypothesized that the cough persists regardless of the initial respiratory disease due to medical and social attention caused by chronic cough. Coughing can also be maintained by avoiding a certain environment, such as school or work. As a result of positive reinforcement (eg, medical and social care) and negative reinforcement (eg, avoiding school or work) this syndrome becomes a learned behavior that is formed and maintained by the environment. It may be that the cough is stimulated by physical factors related to chronic cough, and is supported by positive reinforcement. That is, the patient may cough persistently because he experiences moderate throat irritation after the disease, which brings short-term relief. Then the throat irritation intensifies and may, in turn, stimulate again the cough reflex, which increases, etc. [15].

Fenichel O. [26] indicated that in some patients the coughing habit is the result of an unconscious interest in being sick. Increased anxiety of the mother, focusing on respiratory symptoms may be the cause of the consolidation of the cough reflex in the child. Recurrent respiratory infections are likely to be the trigger for psychogenic cough in most cases [12].

**Psychogenic cough protest (signal cough).** This type of cough is most consistent with the name of psychogenic. This is due to the fact that children in this case cough because of purely psychological moments and the onset of such a cough is almost always intentional, as a sign of protest, or as a reaction to certain circumstances, or as a way to achieve their goal [3]. Some authors believe that this type of cough often occurs in children in families where the child's parents and family show hyper- or hypo-care, or in families where the child is abused. In fact, it is a means of relieving the internal pressure caused by repression, because children in this case are not able to express their emotions, problems, or attract attention [15].

Some researchers consider this type of cough as a way of secondary benefit for phobic children [14], while others consider it as a way to express hidden dissatisfaction with their families [27]. Grumet G. W.



[28] explained this phenomenon as follows: "Just as weeping serves the dual function of washing irritants out of the eyes and expressing unhappiness. so does the cough share overlapping roles in discharging emotion and clearing the lungs". Behavioral psychology explains this as learned behavior that is formed and maintained by reinforcing the environment, which can be positive (social attention) or negative (school avoidance) [17].

The development of chronic lung disease in a person close to the child can lead to unconscious copying of the cough, which will be psychogenic in nature [12]. In this case, against the background of rivalry between siblings, or when he observes increased attention to his relative or acquaintance, the child identifies with this person and repeats his behavior, ie coughs to attract more parental attention and avoid certain responsibilities. (cleaning, housework, homework, school attendance, etc.) [17].

The first two types of cough are closely related. Thus, the signal, or psychogenic cough, which usually occurs as a reaction to stressful situations in the family and school, becomes habitual over time (by the mechanism of the conditioned reflex) [3]. Conversely, a coughing habit that is reinforced by attention or other benefits to the child often becomes psychogenic.

**Tic cough.** The etiology and pathogenesis of tics remain completely unexplored. Among the main theories of tic development, the most popular are two: psychological and genetic [12]. The main role in psychological theory is played by stress, ie in this case psychogenic cough is a consequence of external traumatic factors. A smaller role in the occurrence of tics is assigned to the trigger theory when tics are one of the stages in the development of obsessive-compulsive personality disorder. It is also worth noting that tics are regarded as a normal stage of motor-emotional development in hyperactive children that do not require treatment (psychodynamic theory). For a child who is in a state of constant anxiety, tics are an additional pathological form of psychomotor discharge that reduces internal stress [12]. According to genetic theory, the predisposition to tics is transmitted by the autosomal dominant type of inheritance with

incomplete penetrance and different expressiveness. It has been established that the expression of tics is influenced by the androgen receptor gene, which is located on the X chromosome, which explains the high frequency of tics in boys [12].

There is evidence that the role of a burdened perinatal history (asphyxia, hypoxic-ischemic CNS damage, ventricular hemorrhage, intrauterine infection), which contributes to the earlier appearance of tics and their more severe course [12].

It is believed that the main factors that contribute to the occurrence of tics are an unfavorable emotional situation in the family, watching horror movies, conflicts with peers, attending kindergarten or school. It should be noted that most researchers assign a leading role in the genesis of tics to psychologic traumatic experiences in the family. Abuse of not only the child but also one of the parents, often the mother, is a significant etiological factor. It has been noted that tics are exacerbated in the presence of parents, teachers, or health professionals [12].

It should be noted that most often all types of psychogenic cough in children are associated with an unfavorable psychological climate in the family (quarrels and conflicts of parents, rudeness towards the child or each other; lack of attention; excessive parental care; fear of punishment; painful reaction to criticism, anxiety, trauma, problems with socialization at school, etc.)

Contributing factors also include emotional experiences, especially during puberty, phobias, fear of rejection, and the need for attention [18, 29].

It should be emphasized that the increased anxiety of parents, their concentration on the child's cough may be the cause of the consolidation of the symptom, which dictates the need for careful diagnosis, medical intervention, and consultation with a psychotherapist [3].

### Diagnosis

The diagnosis of psychogenic cough is usually established, excluding other disorders that can cause frequent and persistent cough. That is, when there is a chronic cough without confirmed signs of

acute or chronic diseases and negative laboratory results are detected, inorganic, in particular psychogenic, etiology should be suspected [15, 25]. It is also necessary to exclude the influence of physical factors, both internal and external [22]. External factors should be noted for prolonged exposure to irritants, tobacco smoke, exposure to cold or dry air, etc. Internal physical factors include irritation and swelling of the vocal cords, hypersensitivity of airway receptors, and others. However, in pediatric patients, the exclusion of all biological disorders and the search for physical exposure can be very difficult and, in some cases, harmful. Diagnostic search exhausts the children and their parents both physically and psychologically. Indeed, some authors believe that in children "the main incidence of whooping cough is iatrogenic, which occurs due to misdiagnosis and excessive treatment" [18].

Today, however, it is important to remember that the absence of a cause of cough does not indicate that the cough is psychogenic. If the link between symptoms and mental, neurological, or psychological factors has not yet been established, the term idiopathic [30] or cough of unknown etiology (unexplained cough) should be used [19]. This will minimize the overdiagnosis of psychogenic cough [18].

**Diagnostic criteria for the diagnosis of psychogenic cough.** In earlier scientific studies, chronic cough was considered psychogenic if it was absent during sleep, persisted despite medical treatment, had a characteristic sonorous "barking" tinge, or was associated with mental illness.

To date, these characteristics are not sufficient to diagnose psychogenic cough. The described evidence does not have sufficient evidence and their diagnostic value is unknown [18], so all clinical signs should be evaluated together. Usually, an important criterion for diagnosis is the absence of organic causes of cough. In addition, the criteria that distinguish psychogenic from other forms of cough and are most often mentioned in the literature include:

- as a rule, the cough is rough, barking, sounds like a "Canadian goose cry" or "bark", has an

explosive character [17, 25], which occurs several times a minute for several hours [31];

- cough is unproductive [17], there is no shortness of breath, fatigue, or changes in voice [31];
- the nature of the cough does not change during the day, week, month [12];
- cough disrupts domestic or social activities [18, 32];
- in most patients there is a daily and seasonal dependence, the cough worsens in the evening and in the autumn-winter period [12];
- patients often report a "tickle" in the throat and may assume a "chin to chest" posture [18];
- it usually stops or decreases sharply at night [17];
- the frequency or severity of cough is reduced by pleasant social activities or with vigorous physical activity [18, 31, 32];
- the stereotypical tilt of the torso forward with the hand closed [31];
- often cough is caused by emotional experience [18];
- increase in the intensity of cough in the presence of parents, teachers or health professionals, or when the patient understands that he is being watched [15, 17, 18];
- characteristically, the cough worsens before and during the examination by a doctor, stopping after it (relieving the stress of waiting) [3];
- a new cough attack can be provoked by touching on an unpleasant topic for the child (whims, adherence to the daily routine) or even just starting an abstract conversation, as if not paying attention to it [3];
- with a quick conversation, reading poems, the cough decreases or disappears [12, 31];
- recurrence of cough at the request of a doctor [33];
- cough is not suppressed by bronchodilators, antitussives, corticosteroids, antibiotics, and other drugs [12, 17, 33];
- cough is not exacerbated by laughter, stress, crying or any change in the environment [15, 17], such as dampness or extreme temperatures [15];
- the presence of benefits for the child, which he receives from coughing (for example, increased

attention of parents, which he seeks or does not attend school) [18, 32];

- the patient shows an artistic apparent indifference to cough [18], or a relative lack of concern about symptoms [31];
- the patient is the youngest sibling in a large family [18];
- patient - a family member in which one of the relatives has a chronic cough of an organic nature, such as a patient with cystic fibrosis [18];
- excessive parental control [32];
- school phobias [29];
- fear of being abandoned and the need for attention [18, 29, 34];
- normal results of laboratory and instrumental diagnostics during cough episodes [31].

Patients with a psychogenic cough often have hyperventilation syndrome, which is manifested by respiratory discomfort in the form of dissatisfaction with breathing, which patients describe as shortness of breath, dyspnea, and even asphyxia. This feeling is intensified in stuffy rooms. Frequent sighs and yawns, marked by the patients or parents, are characteristic. Complaints of heart pain, arrhythmia, feelings of anxiety and fear, and other manifestations of autonomic dysfunction are often observed [12].

Of course, each of the symptoms or signs described above cannot be used separately as a pathognomonic sign of a psychogenic cough. These characteristics of cough do not have specifics for diagnosis and can be associated with various diseases [23].

For example, barking whooping cough is considered a characteristic feature of psychogenic cough, but only 8 of the 18 studies in the systematic review [9] report this characteristic of cough. Barking cough can also be a symptom of tracheomalacia and bronchiectasis. Only 52% of those diagnosed with a psychogenic cough had a "barking" character (ie, copper or lobar) [18].

The absence of cough at night should also not be considered as a characteristic feature of psychogenic cough, because it may be absent in organic diseases (bronchitis, gastroesophageal reflux disease [35, 36], or decrease sharply at night) [18, 19]. In one study [37], which used a cough

meter, showed that cough still occurs during sleep in patients diagnosed with somatic (psychogenic) nature of the disease [7].

Accordingly, based on the collected data, the American College of Chest Physicians (ACCP) has issued the following recommendations for the diagnosis of psychogenic cough:

1. In adults with chronic cough, the presence or absence of nocturnal cough or cough with barking or wheezing should not be used to diagnose or exclude the diagnosis of psychogenic cough.

2. In children with chronic cough, the characteristics of the cough can be judged as a psychogenic cough, but not a diagnosis. The presence or absence of nocturnal cough should not be used to diagnose or rule out a psychogenic cough.

3. Common psychosocial problems, such as anxiety, depression, domestic violence, and child abuse/neglect, which are often associated with somatization disorders, should be assessed in adults and children with chronic unexplained cough.

**Tic cough.** In typical cases, tics are short, elementary, and stereotypical movements that can be suppressed by the efforts of the will for a short period of time [12]. Given that the main cause of tic behavior and tics, in particular, are stressful situations, it can often be found that the frequency of tics, including tic cough, decreases when the patient participates in exciting activities. Tic behavior is also exacerbated by stress, emotional distress, or anxiety.

Vocal tic is also presented as cough without excretion, the intensity of which decreases at night [17].

Although there is a similarity between tic and psychogenic cough, there are also differences. One difference is that in most cases there is an organic etiology of tic disorders. Matthews, L.H., Leibowitz, J.M., & Matthews, J. R. [38] report a large percentage of patients with tic disorder with abnormal electroencephalogram parameters and abnormal catecholamine metabolism in the central nervous system. DSM-IV describes a predisposition to tic disorders transmitted by autosomal dominant type. Unlike tics, psychogenic cough is characterized

by the absence of any organic or genetic factors [15].

Another difference is that patients with tic disorder tend to be embarrassed and unaware of their tic behavior, whereas patients with psychogenic cough show typical "ballet indifference" [17, 18]. Patients with tic cough sometimes experience anxiety and depression in response to their disorder. Anxiety and depressed mood are not characteristic of psychogenic cough. Also in tic disorders, such as Tourette's syndrome, the presence of both motor and vocal tics is observed. Patients with Tourette's disease show various motor and one or more vocal tics, which is not typical for psychogenic (somatic) cough [15].

Patients with a tic-associated cough are generally associated with a range of neurobehavioral manifestations (attention deficit disorder, obsessive-compulsive disorder, etc.). Some clinical studies have shown that neuroleptics (dopamine receptor blockers, haloperidol, pimozide) are effective in controlling these disorders, so they should be ruled out before the diagnosis of somatic cough (psychogenic) [7, 18].

Children who have tics have common psycho-emotional personality traits. Most often, these are developed and intelligent children who have many occupations and hobbies, which are exposed to numerous loads at school and after school. They are characterized by increased emotional sensitivity, demonstrative behavior, vulnerability, acute reaction to criticism. In the team such children, as a rule, have problems with peers; they value the evaluation and attitude of other people. These children are often seen by others as proud, stubborn, and unyielding [12].

**Psychogenic cough and mental disorders.** Several studies [32, 36] reported that some of their patients with psychogenic cough were diagnosed with concomitant mental disorders. The diagnosis was made in consultation with a psychiatrist. Thus, Bhatia et al. [29] indicate that 62% of the total number of patients with a psychogenic cough had concomitant mental disorders. The three most common were conversion disorder (22%), mixed anxiety and depressive disorder (12%), and generalized anxiety disorder (10%) [18]. However,

many studies indicate that the presence of chronic cough can itself cause psych morbidity and therefore this criterion is not decisive in the diagnosis of psychogenic cough [19, 39, 40, 41, 42].

Patients with chronic cough who have a history of mental health problems face a diagnostic dilemma. It is often unclear whether psychological problems have contributed to the development or maintenance of cough symptoms or whether they are a separate concomitant problem. The nature of causation needs to be confirmed, and the coexistence of psychological problems should not be overly interpreted as causal. Disagreement can be useful in identifying the causes of cough and facilitating treatment by appropriate mental health professionals [19].

There is a complex relationship between psych morbidity and chronic cough. The term psychogenic cough means that psychological problems are an etiological factor in the development of chronic cough. Alternatively, psych morbidity may be the result of chronic cough in some people. The treatment of chronic cough in primary care is different, and patients can undergo lengthy and unsuccessful studies and therapeutic trials to diagnose and manage symptoms [43]. The long time required to make a clear diagnosis of chronic cough can lead to psychological disorders in some patients. In addition, numerous physical, social, and emotional side effects of chronic cough, such as avoidance of daily activities, interpersonal difficulties, stress urinary incontinence, and avoidance of conversation can affect mental health [19, 44].

#### Treatment

Treatment of psychogenic cough, as well as tic, in general, is a complex and not always a solvable problem. Most researchers point out that the main place in the treatment is given to psychotherapy and the creation of an optimal microclimate in the family and children's institution. It is better to carry out treatment on an outpatient basis because in the hospital tic disorders can be significantly exacerbated [12].

Several strategies may be effective in treating a patient with suspected psychogenic cough [7]. Concerning drug exposure, the Food and Drug



Administration (FDA) has not approved any medication to treat psychogenic cough. There are few studies on the role of pharmacotherapy in these cases [17]. Before prescribing medical treatment, it is necessary to determine whether the child should be exposed to drugs. Pharmacological treatment is indicated only if the psychogenic cough disrupts social adaptation and interpersonal relationships. If this treatment is still prescribed, it is desirable to prescribe the minimum effective dose [12].

Thus, according to the literature, the greatest effectiveness (about 80%) in the medical treatment of tic cough is observed in the appointment of neuroleptics [12]. However, the therapeutic effect of neuroleptics has significant side effects, especially with long courses of treatment. Selective serotonin reuptake inhibitors may be effective in concomitant obsessive-compulsive disorder. Also, some researchers suggest the role of this group of drugs in the treatment of comorbid anxiety disorders, while escitalopram demonstrates a favorable side effect profile during long-term therapy [17]. Stimulators of the central nervous system, improving the symptoms of hyperactive behavior, can, however, increase tics in some children [12].

Some studies have reported the use of drugs such as antibiotics, antitussives, antihistamines, bronchodilators, and steroids in psychogenic cough [9]. However, the question arises as to whether the diagnosis of psychogenic cough was correct and if pharmacological agents were used in conjunction with psychotherapy, which of these treatments actually helped the patient.

After excluding serious and common diseases associated with chronic cough, it may be more appropriate to focus on controlling the symptoms rather than the cause of the cough [19]. This is helped by a variety of psychological techniques that allow the patient and his family to understand the causes of cough and the possibility of self-suppression of this symptom, while in different ways to create conditions to encourage this practice. Therefore, therapy based on behavior modification or psychological counseling should be considered in patients with psychogenic cough as the therapy of choice [7], which is more effective than the use of pharmaceuticals [9, 18, 34].

Also, doctors and parents often face the problem that many children with psychogenic cough consider their cough as a reflex over which they have no voluntary control [42, 44] and this causes a kind of resistance to psychotherapy. However, studies of functional magnetic resonance imaging demonstrate the role of supramedullary pathways, including the cerebral cortex during coughing, and changes in brain behavior during active cough suppression [45], indicating a voluntary component of cough. The treatment process aims to teach patients to voluntarily control their cough behavior [19].

At the same time, the role of parents is not even important, but of parents, who should not pay excessive attention to tics or psychogenic cough. Attempts to punish, pull the child at the moment of tics, to show his negative attitude towards them are unacceptable. In response to remarks and indications of such behavior, the child focuses on coughing, which further exacerbates it [12].

There are many methods of psychological treatment of psychogenic cough and we will try to consider in our review the most common techniques.

**Suggestion therapy.** A fairly common method of treating psychogenic cough is suggestive therapy (suggestion therapy). Suggestive therapy involves informing the doctor and his family that the cough is a habit, that it is unnecessary and not associated with any physical illness, and that it is under their control and the possibility of its termination [9, 15, 46]. This didactic information, which is passed on to the patient and parents, seems to be a key component of suggestive therapy. The success of suggestion therapy depends on the doctor's ability to convince the patient and his family [15].

Some authors report successful treatment of psychogenic cough through a combination of suggestive therapy and behavioral modification techniques [47, 48]. Lokshin B. and others [47] reported cases where the doctor convinced the patient that he could teach him how to control his cough. The doctor urged the patient to suppress the cough, using inhalation through a local anesthetic nebulizer. The doctor has repeatedly expressed confidence in the patient's ability to suppress the

urge to cough and consistently intensified short periods of self-control with praise and encouragement [15].

Another variant of such therapy was described by Lorin M.I. and others [48]. Treatment involved explaining to the patient that coughing was a habit and then encouraging her to voluntarily suppress the cough (suggestive therapy). The patient was taught to perform two incompatible actions when she felt the urge to cough. First, she had to keep an object in her mouth, such as a lollipop, which reminded her not to cough. Second, whenever she felt the urge to cough, she had to look at her watch and suppress her cough for some time [15].

Suggestion therapy is quite simple and justified given the causes of psychogenic cough, although many researchers have used in practice a combination of several methods, or additional medication, which makes it difficult to determine the effectiveness of this treatment. According to the scientific literature, when using this method of treatment, the cough disappeared in 96% of cases [9].

**Sheet technique.** In 1984, Cohlan S.Q., and Stone S.M. [25] described the use of an enhanced suggestion technique that combined suggestive therapy with the sheet technique. In this case, the doctor first convinces the patient and his family that he or she knows exactly what the problem is and how to treat it. He then informs the patient that his or her pectoral muscles are weakened by coughing and that the chest is no longer able to suppress the urge to cough [15]. The doctor then ties the sheet tightly to the patient's chest and informs him or her that the sheet will strengthen the weakened chest muscles and thus allow the patient to suppress the cough. The doctor then instructs the patient and his parents to wear the sheet under his clothes, even during school, until the patient is convinced that he can control the cough without it [15].

The success of this enhanced suggestion technique appears to depend on the physician's ability to convince the patient that the cough is easily curable and on the degree of discomfort caused by wearing the sheet for the patient. Aversiveness can cause the inconvenience of wearing a very noticeable sheet under clothing or

the pain that occurs when a patient tries to cough. In addition to the typical criticism associated with the use of aversive techniques and ethical issues regarding the use of punishment, critics of this technique point to outright deception that a physician should use for treatment [25], however, emphasized the immediate success of the technique.

**Differential reinforcement.** Differential reinforcement involves reinforcing appropriate behavior while ignoring inappropriate patient behavior. There are three most common reinforcement techniques: low-response differential reinforcement (DRL), differential reinforcement of other types of behavior (DRO), and differential reinforcement of incompatible behavior (DRI). The ultimate goal of all three methods is to eliminate problem behaviors and replace them with the desired behavior [15].

With DRL, the doctor and parents ignore the cough but encourage the child's behavior in the absence of cough. For example, parents may encourage their children to try to cough less and then verbally praise them when they do. You can also introduce a tangible reinforcement system in which the patient would receive any points that should be exchanged for small toys or money, as it has successfully reduced its cough rate. It is also possible to regulate the child's social activities in this way (for example, walking, using gadgets, watching TV) depending on the consistent reduction in the frequency of coughing during the day [15].

DRO psychological technique involves the complete removal of cough suppressants and the intensification of any behavior other than cough. In this case, against the background of complete disregard for cough, the child is given other important tasks (housework, cleaning, gardening, etc.) while for the tasks the child receives certain benefits (buying a certain thing, attending an event, etc.). At the same time, her additional activity is encouraged and praised every time and no attention is paid to coughing. It is important to interest the child in the quality of tasks [15].

The DRI technique involves teaching the patient behavior that is incompatible with coughing and then intensifying each case of incompatible

behavior. Bemstein L. [13] described a case of a 12-year-old girl who did not cough as long as her mouth was closed. She was given a flat button so that she could pinch it between her lips, demanding that she breathe through her nose. After 3 days of successful cough suppression, the child stopped using the button, continued to breathe with his mouth closed, and later stopped coughing.

Sometimes when using these techniques there is such an effect as an "outbreak of extinction", which occurs when previously enhanced behavior (attention to cough) is no longer amplified ("extinct"). At the same time, there is a sharp increase in the strength and frequency of cough, which indicates either the child's desire to return to the previous conditions or to test the "strength" of the parents or the doctor [15].

**Aversive methods.** Two published studies report the use of aversive treatments for psychogenic cough. In one case, treatment initially involved explaining the nature of the cough to the patient and his family and justifying the use of aversive techniques. This is followed by the use of painful but harmless electric shock, in cases where the patient is coughing [15]. The second study described by Creer et al. [21] was quite interesting. To treat a 14-year-old boy with a psychogenic cough, the authors used numerous psychological and other methods to eliminate the cough. No methods were effective. The authors then suggested the use of aversive treatment for the patient and his family. The cough was completely eliminated after a single electric shock to the patient's forearm.

Despite the extreme effectiveness of mild electric shock as a treatment for psychogenic cough, there is controversy over the ethics of using aversive procedures, when non-aversive methods have proven effective [15]. These methods should be considered only in the case of resistant types of psychogenic cough (when there is a clear connection between the symptom and the psychological state of the patient).

There are also other treatments for psychogenic cough, such as hypnosis [9, 33], botulinum toxin type A injections [49], and cognitive psychotherapy [9]. However, some studies also indicate a fairly high

efficiency of these treatments, although the described cases of use are isolated.

In addition to methods of psychological treatment, such children also need to streamline their daily routine: minimize watching TV, computer classes, normalize night and day sleep. Regular physical activity, sports are recommended [12]. You should limit the use of products containing caffeine (tea, coffee, sodas, chocolate). Enrich the diet with foods containing magnesium (green vegetables, peas, nuts, etc.) [12].

Thus, the main provision of treatment of psychogenic cough is not its suppression, but the creation of conditions for a normal surrounding microclimate.

Although virtually all scientific studies describe various psychological techniques as extremely effective, there is no evidence to support specific behavioral therapy [31]. To date, there is a lack of randomized, controlled trials comparing different treatment strategies [34, 50]. Nevertheless, all researchers point out that these methods are still the basis for the treatment of psychogenic cough, and consultation with a psychologist or psychiatrist is mandatory. Some patients may be outraged that they are suspected of having a psychological disorder, and this may require a delicate and tactful discussion of psychological issues. Scheduled screening for anxiety and depression in patients with chronic cough, similar to screening for other comorbidities, can normalize the treatment of psychological problems in this population and help identify patients at risk [15].

### Conclusion

A review of the literature has shown that psychogenic cough remains an important medical problem today, the true prevalence of which remains uncertain today. But despite this, psychogenic cough occupies an important place in the structure of diseases, the main symptom of which is chronic cough. When diagnosing this type of cough, it is necessary, in addition to excluding organic pathology, to pay special attention to the presence of the patient's psychological preconditions for the development of this symptom. The described diagnostic criteria are not specific, but together allow to diagnose and suspect the

psychogenic nature of cough. Today's treatment should be carried out strictly individually, taking into account the psychological preconditions for the development of cough. The method of choice for the treatment of patients with psychogenic cough is psychotherapy and other non-pharmacological methods. Despite the insufficient evidence base, methods of psychological influence on the patient and elimination of both the causes of cough and the actual symptom are considered the basis for the treatment of this disease. Therefore, knowledge about the causes of development, features of the clinical course, and treatment of psychogenic cough is important today for doctors of any specialty, especially for family physicians, pulmonologists, pediatricians, neurologists, and psychiatrists.

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