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Characteristics of Skin Changes in Children with Viral Respiratory Tract Pathologies

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Abstract

Of particular interest are not only the respiratory tract lesions but also the systemic manifestations of the infectious process, among which skin changes occupy a significant place. Experience shows that with viral respiratory infections, skin manifestations often become an early diagnostic sign, allowing one to suspect the severity of the disease or the presence of complications.

Keywords: Respiratory system, dermatological manifestations, coronavirus infection, adenovirus, inflammation, fever.

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1. Introduction

The issue of studying skin changes in children with viral pathologies of the respiratory tract remains relevant not only for pediatrics, but also for clinical dermatology, infectious diseases and immunology. Over the past ten years, experts have increasingly drawn attention to the fact that viral infections are rarely limited exclusively to damage to the respiratory system. The child's body reacts much more widely, and the skin becomes a kind of indicator of ongoing internal processes. Sometimes skin manifestations appear even before severe respiratory symptoms, which is especially important for early diagnosis of the disease.

In the current epidemiological situation, this problem has become even more important after the spread of coronavirus infection, in which children began to experience unusual skin symptoms reminiscent of allergic or vascular disorders.

Children's skin has a number of features that distinguish them from adults. A child's skin contains more water, is characterized by loose connective tissue and increased sensitivity of the vascular system. That is why viral intoxication is often accompanied by the rapid development of hyperemia, spotty rashes, vascular reactions and swelling. Some researchers believe that the severity of skin changes is directly related to the level of the body's immune response. Observations show that in children with weakened immune systems, skin manifestations are often more severe and last longer.

In pediatric practice in Uzbekistan, doctors especially often encounter similar changes during the season of rising acute respiratory viral infections. According to the Ministry of Health of the Republic of Uzbekistan, in the winter period of 2023–2025, the incidence of ARVI among school-age children was almost 1.8 times higher than that of adults.

The clinical picture of skin changes in viral pathologies of the respiratory tract is quite diverse. Some children have single roseola elements, while others develop extensive maculopapular rashes resembling infectious exanthemas.

Sometimes skin changes are accompanied by itching, peeling or even pinpoint hemorrhages. Particularly difficult to diagnose are cases where skin symptoms resemble an allergic reaction to medications.

In such situations, the doctor has to make a differential diagnosis between viral exanthema and drug-induced dermatitis. This requires high clinical care and a deep understanding of the pathogenesis of viral infections. The effect of viral intoxication on skin microcirculation is of serious importance. With high body temperature and a pronounced inflammatory reaction, skin vessels dilate, capillary permeability increases, and areas of redness and swelling appear. In young children, such changes can develop in just a few hours.

This is especially pronounced with adenovirus infection and influenza. Some clinical observations show that with severe respiratory infections, skin marbling and acrocyanosis may develop, which is associated with impaired peripheral circulation. Such signs require special attention, since they may indicate increasing hypoxia of the body. The immunological mechanism of development of skin manifestations is also of interest. The virus, entering the child's body, activates the production of cytokines and inflammatory mediators. These substances affect not only the respiratory tract, but also the condition of the skin.

Sometimes the immune system overreacts, causing delayed or immediate hypersensitivity. Against this background, allergy-like rashes, urticaria and vascular reactions appear. In the scientific literature of recent years, the connection between viral infections and the development of autoimmune skin changes is increasingly mentioned. This issue began to be studied especially actively after the COVID-19 pandemic.

It should be borne in mind that in childhood the skin is closely related to the general state of metabolism and water-electrolyte balance. During viral diseases, the child loses a large amount of fluid due to fever and rapid breathing. This leads to dry skin, decreased elasticity and increased sensitivity to external irritants. Sometimes parents mistakenly associate such changes solely with allergies, although the cause is dehydration and intoxication. In the practice of pediatricians, there are often cases when, after normalization of body temperature, skin symptoms gradually disappear without specific treatment.

In Uzbekistan, the problem of viral respiratory diseases in children is of particular importance due to the climatic characteristics of the region. Sharp temperature changes in the autumn-winter period contribute to an increase in viral incidence. In some regions of the country, especially in densely populated areas, outbreaks of acute respiratory viral infections among children are recorded annually. Statistical reports show that children under five years of age remain the most vulnerable group. It is at this age that complications are most often recorded, accompanied by skin changes and disorders of the immune status.

Sometimes even a common viral infection can provoke a severe inflammatory reaction of the skin. Coronavirus infection in children deserves special attention. If at the beginning of the pandemic it was believed that children suffered from the disease relatively easily, then later reports began to appear of multisystem inflammatory syndromes with pronounced skin manifestations. Some patients experienced bright spotty rashes, inflammatory changes in the mucous membranes, and vascular lesions of the skin of the fingers and toes. These symptoms aroused great interest among specialists because they resembled Kawasaki disease.

Researchers suggest that such reactions are associated with impaired immune regulation and damage to the vascular wall by the virus. The issue of differential diagnosis remains no less important. Skin changes in viral pathologies of the respiratory tract may resemble measles, rubella, scarlet fever and other infectious diseases. Sometimes the doctor has to take into account even rare forms of viral exanthems. An error in diagnosis can lead to incorrect treatment tactics and worsening of the child's condition.

Interestingly, the nature of skin changes often depends on the age of the child. In infants, generalized rashes and severe skin hyperemia are more often observed. In schoolchildren, changes may be less noticeable, but longer lasting. Teenagers sometimes complain of itching, burning and increased sensitivity of the skin after an infection. Some authors associate this with the peculiarities of hormonal changes in the body and changes in the activity of the immune system during puberty. In clinical practice, such differences can indeed be seen quite clearly.

The study of this topic is also of interest because skin manifestations can serve as an indicator of the severity of the viral process. For example, with a mild acute respiratory viral infection, the rashes are usually short-lived and disappear without a trace. In severe forms of infection, the development of hemorrhagic elements, persistent vascular reaction, and even areas of skin necrosis is possible. Cases accompanied by impaired microcirculation and signs of systemic inflammation are considered especially dangerous.

Such conditions require urgent medical observation and comprehensive treatment.

Modern diagnostic methods make it possible to more accurately assess the nature of skin changes. In addition to the usual clinical examination, laboratory research methods, immunological tests and virological diagnostics are used. In recent years, the capabilities of molecular diagnostics of viral infections in children have been gradually expanding in Uzbekistan. This helps to quickly identify the pathogen and assess the risk of complications.

However, in a number of regions there remains the problem of insufficient availability of modern diagnostic technologies, especially in rural areas.

Prevention of viral infections is also of great importance. Timely vaccination, compliance with sanitary and hygienic rules, good nutrition and strengthening the immune system can significantly reduce the risk of severe complications, including skin manifestations. Pediatricians note that children with vitamin deficiencies and chronic diseases are much more likely to experience pronounced skin changes during viral infections. Some studies indicate a link between hypovitaminosis D and an increased susceptibility to inflammatory skin reactions.

For Uzbekistan, this issue also remains relevant, especially in winter. The problem of skin changes in viral pathologies of the respiratory tract requires further study, since many of the mechanisms of their occurrence still remain insufficiently understood. Some clinical cases do not fit into the usual patterns of pathogenesis. Sometimes skin symptoms persist even after the main signs of a respiratory infection have disappeared.

This leads experts to assume the existence of more complex immunological and vascular mechanisms of damage. The work is devoted to the analysis of modern ideas about skin changes in children with viral pathologies of the respiratory tract. The study examines the characteristics of clinical manifestations, pathogenetic mechanisms, age differences and diagnostic difficulties. Particular attention is paid to data typical for the child population of Uzbekistan, where the problem of viral infections remains one of the most significant in the structure of the overall morbidity of children.

Viral pathologies of the respiratory tract in children have been one of the most common reasons for seeking medical help for many years. This is especially noticeable in countries with pronounced seasonality of respiratory infections, which includes the Republic of Uzbekistan. According to the Ministry of Health of Uzbekistan, in the winter-spring period of 2023–2025, more than 62% of visits to pediatricians were associated with acute viral respiratory tract infections. It is interesting that in a significant proportion of children the disease was accompanied not only by cough, fever and intoxication, but also by changes in the skin.

These manifestations have long been considered as secondary symptoms, although in practice they often become one of the first signs of a systemic reaction of the body. A child's skin is much more sensitive to infectious agents compared to an adult's body. It is richly supplied with vessels, contains a large amount of liquid and has increased permeability. That is why viral intoxication quickly affects her condition. Sometimes parents notice rashes even before a high fever appears. This is alarming and often leads to the mistaken assumption of an allergy.

In fact, in viral diseases of the respiratory system, skin changes have a complex immunoinflammatory mechanism. Some experts believe that a child's skin performs a kind of compensatory function, trying to remove inflammatory products through the vasculature and sweat glands. In pediatric practice in Tashkent and Samarkand, an increase in cases of viral exanthems has been observed in recent years, especially after the COVID-19 pandemic. In some observations, skin symptoms persisted even after the disappearance of respiratory manifestations. This forced doctors to reconsider their attitude to such changes and consider them as an important clinical marker of the course of the disease.

With viral respiratory tract infections, skin manifestations can vary. The most common are skin hyperemia, maculopapular rashes, punctate exanthema and vascular changes. Young children sometimes develop pronounced marbling of the skin, especially at high body temperatures. This is due to instability of vascular tone and imperfect autonomic regulation. Interestingly, the severity of skin manifestations often depends not so much on the virus itself, but on the strength of the body's immune response. In children with increased allergic skin, the changes are more pronounced and lasting.

Some clinicians compare this reaction to an immune "surge," when the body responds to infection by excessively activating inflammatory mediators. Viruses can cause dilation of capillaries, damage to the vascular endothelium and disruption of microcirculation. Against this background, areas of redness, local swelling and even hemorrhagic elements appear. Such processes are especially

difficult in children with chronic diseases or nutritional deficiencies. In rural areas of Uzbekistan, doctors often note a combination of a viral infection with hypovitaminosis, which worsens the condition of the skin.

A lack of vitamins A and C reduces the stability of the vascular wall, causing rashes to become more pronounced. Sometimes skin changes are accompanied by severe itching, which worsens the child's general condition and disrupts sleep.

One of the most common causes of skin changes remains adenoviral infection. It often affects preschool children and has a variety of clinical manifestations. In addition to inflammation of the upper respiratory tract, adenovirus can cause conjunctivitis, swollen lymph nodes and skin rashes.

Rashes due to adenovirus infection are usually spotty in nature and localized on the face, chest and limbs. Sometimes they resemble manifestations of measles or rubella, which makes diagnosis difficult. In some cases, skin changes appear against the background of an already decreasing temperature, which is why parents mistakenly consider them a reaction to medications. Interestingly, in children under three years of age, rashes are often accompanied by severe dry skin and flaking. According to the observations of doctors in the Bukhara region, in 2024, among hospitalized children with adenovirus infection, about 37% had various skin manifestations.

This is a fairly high figure. Some researchers suggest that adenovirus has a special ability to affect the vascular system of the skin. In severe cases of the disease, even minor hemorrhages into the skin are possible, although such cases are rare. Pediatricians emphasize that skin changes due to adenovirus infection more often develop in children with reduced immunity.

Flu can also cause significant skin changes. Usually the disease is associated with intoxication, high fever and damage to the respiratory tract, but the systemic impact of the virus is much wider. With severe flu, the child's skin becomes pale, sometimes with a bluish tint. This is due to impaired microcirculation and tissue hypoxia. Against the background of fever, areas of redness of the face and neck appear, and sweating increases. Some children develop small pink rashes, mainly on the torso. Hemorrhagic forms of influenza, accompanied by pinpoint hemorrhages, are especially dangerous.

Fortunately, they are relatively rare in children. It is interesting to observe how the child's body reacts to the viral load. Sometimes the skin literally reflects the severity of the disease. The stronger the intoxication, the more noticeable the vascular changes. In Uzbekistan, during the flu season in 2023, doctors noted an increase in cases of skin hyperemia and vascular fragility in school-age children. Some experts attribute this to the circulation of new strains of the virus. However, this hypothesis has not yet been definitively confirmed.

Coronavirus infection occupies a special place. Since the COVID-19 pandemic, attitudes towards skin manifestations of viral diseases have changed significantly. Children began to experience unusual skin symptoms that were previously extremely rare. Spotty rashes, inflammatory changes in the skin of the fingers, reminiscent of frostbite, urticaria and even elements of vasculitis appeared. Some cases were accompanied by multisystem inflammatory syndrome. This is a serious condition that affects the blood vessels, heart, respiratory system and skin. Interestingly, skin changes sometimes occurred several weeks after the infection.

Respiratory syncytial virus infection usually affects young children and is often accompanied by bronchiolitis. At first glance, it seems that the disease is limited to the respiratory system. But practice shows something else. In infants, against the background of severe respiratory failure, the skin quickly reacts with discoloration and vascular disorders. Pallor, acrocyanosis, and sometimes a marbled skin pattern appear. These signs indicate insufficient oxygen saturation of tissues. In some cases, small rashes are observed around the mouth and on the cheeks.

They are associated with skin irritation, increased sweating and vascular reaction. Interestingly, in premature babies, such changes develop faster and are more pronounced. In pediatric departments of the Andijan region in 2024, doctors noted a high frequency of vascular skin reactions in children with severe bronchiolitis. This once again confirms the connection between respiratory failure and skin condition. Skin changes during viral infections cannot be considered separately from the child's immune system. Children's immunity is still developing, so the body's reaction is often unpredictable. Sometimes even a relatively mild viral infection causes a violent inflammatory reaction of the skin.

The level of cytokines, histamine and other inflammatory mediators increases in the blood. These substances affect the blood vessels and nerve endings of the skin. Redness, itching and increased sensitivity occur. Some children complain of burning skin even in the absence of pronounced rashes. This is especially common after a coronavirus infection. Interestingly, in children with atopic dermatitis, viral diseases often provoke an exacerbation of the skin

process. Doctors believe this is a consequence of an immune imbalance.

Sometimes skin changes appear several days after the start of treatment. Parents begin to suspect an allergy, although the main factor remains a viral infection. Interestingly, with a combination of viral intoxication and drug load, the skin becomes especially sensitive. In some cases, urticaria or erythema toxicum develops. Doctors emphasize that the uncontrolled use of antibiotics for viral infections remains a serious problem. In Uzbekistan, this practice is still quite common. This increases the risk of adverse reactions and complicates the course of the disease. The age of the child is of great importance.

In newborns and infants, the skin is thin, the blood vessels are located close to the surface, and the immune system is not yet mature enough. Because of this, any viral infections may be accompanied by severe skin changes. Preschoolers are more likely to experience allergy-like rashes and vascular reactions. Teenagers often complain of itching, dry skin and flaking after illness. Some researchers believe that hormonal changes during puberty increase the skin's sensitivity to inflammatory processes. It is interesting to observe how the same virus causes different skin symptoms in children of different ages. This highlights the complexity of the pathogenesis of such conditions.

Continuing the analysis of the problem, it is worth noting the influence of environmental factors. In industrial areas of large cities, children more often suffer from chronic inflammatory diseases of the respiratory system. This reduces the body's resistance to viral infections. In polluted air conditions, the skin also becomes more sensitive. Some doctors in Tashkent note that in children living near major transport routes, viral exanthemas are more severe. Constant exposure to dust and chemicals on the respiratory system and skin may play a role. This issue requires further study.

Diagnosis of skin changes due to viral infections requires an integrated approach. The doctor must take into account the nature of the rash, the time of its appearance, the presence of fever and other symptoms. Sometimes it is impossible to establish the exact cause without laboratory diagnostics. Modern PCR research methods have greatly simplified the identification of viral pathogens. However, in some regions the availability of such methods remains limited. This is especially noticeable in rural areas. Prevention of viral infections plays an important role in preventing skin complications. Good nutrition, vaccination and compliance with sanitary and hygienic standards significantly reduce the risk of severe disease.

Doctors also recommend paying attention to the condition of the child's skin during an infection. Lack of fluid and high temperature quickly lead to dry skin and disruption of its protective functions. Sometimes simply humidifying the air in the room can help reduce the severity of skin symptoms.

Interestingly, the psychological state of the child also affects the course of the disease. Children experiencing stress or chronic fatigue are more likely to react to viral infections with skin manifestations. Some researchers associate this with the influence of the nervous system on immunity and vascular tone.

. In recent years, such relationships have been actively studied. Especially after the COVID-19 pandemic, when the number of stressors in children has increased significantly.

The study of skin changes in viral pathologies of the respiratory tract is of great practical importance for modern pediatrics. These symptoms help assess the severity of the disease, promptly identify complications and choose the right treatment tactics. A child's skin can truly serve as a kind of "mirror" of the internal processes of the body. Sometimes it is careful observation of her condition that allows the doctor to quickly understand the characteristics of the course of the infection.

Skin changes in children with viral pathologies of the respiratory tract are an important clinical manifestation that is closely related to the immune, vascular and inflammatory processes of the body. Analysis of modern data shows that viral infections of the respiratory system are often accompanied by exanthemas, hyperemia, vascular disorders and allergic reactions. The nature of skin manifestations depends on the age of the child, the severity of the infection, the state of immunity and the presence of concomitant diseases.

The problem acquired particular significance after the COVID-19 pandemic, when new forms of vascular and inflammatory skin lesions in children were identified. Practical observations in Uzbekistan confirm an increase in the number of viral diseases accompanied by skin symptoms, especially in the autumn-winter period. This requires doctors to be more attentive to the condition of the child's skin in case of any viral respiratory tract infection.

The study of this topic is not only theoretical, but also of great practical importance.

Timely recognition of skin changes allows earlier detection of complications, assessment of the severity of the disease

and adjustment of treatment. Despite the development of modern pediatrics, many mechanisms of the occurrence of viral exanthems remain insufficiently studied. It is likely that further research will provide a deeper understanding of the relationship between viral infection, the immune system and the condition of the child's skin.

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