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Article / Review

ETIOPATHOGENETIC DEVELOPMENT FACTORS, CLASSIFICATION AND DEGREES OF OCCUPATION OF CHEST DEFORMITY

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Annotation. Deformities of the anterior chest wall include damage to the sternum, ribs and muscles, as well as systemic anomalies that lead to disruption of the function and/or shape of the chest. Etiopathogenetic mechanisms of chest deformation, their diagnosis and surgical reconstruction of the chest are an urgent problem in pediatric surgery. This review article examines the etiology and pathogenesis of the development of chest deformities in children and adolescents, and describes in detail the classification and its variations. In recent years, complex classifications based on three-dimensional modeling and quantitative assessment of chest deformities have been proposed. The ASFI classification is also proposed, which includes classification features: type of defect (Anomaly), symmetry of deformation (Symmetry), types of functional disorders (Function) and main assessment indicators (Indices). The use of such a systematic, quantitative classification, which describes external signs instead of traditional terms, allows us to determine the tactics of treatment and management of patients with deformities in the future. The article summarizes the latest scientific data published by both domestic and foreign researchers on this problem.

Key words: deformation, funnel-shaped, excavatum, dysplasia of connective tissue.

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Bolalarda ko‘krak qafasining deformatsiyalari – ko‘krak qafasining shakli, hajmi va o‘lchamlarining patologik o‘zgarishi bo‘lib, ko‘krak devorining asosiy tarkibiy qismi bo‘lgan qovurg‘alar, ularning tog‘aylari va to‘sh anomaliyalarini o‘z ichiga oluvchi va to‘sh-umurtqa masofasining qisqarishi yoki uzayishi, uning natijasida ichki a’zolar topografiyasining buzilishiga olib keluvchi nuqsonlardir[1–5]. Bu deformatsiyalar mustaqil ravishda yoki tayanch-xarakat apparatining turli anomaliyalari bilan birga uchrashi mumkin[5–7]. Ko‘krak qafasi deformatsiyalarining 90% ini girdobsimon deformatsiyalar tashkil qiladi[4,5,8–10]. Ikkinchi o‘rinda esa kilsimon deformatsiyalar[3,9,11–13] va keyingi o‘rinlarda qovurg‘alarning turli anomaliyalari[4,14], Poland[7,12], Kurarino-Silverman[5,11] sindromlari, to‘shning ajralishi[2,8,15,16] va h.k. lar hisoblanadi. Umuman olganda ko‘krak qafasi deformatsiyalari aholining 1-4 % ida uchraydi. Bolalar orasida (ko‘proq o‘g‘il bolalarda) ushbu ko‘rsatkich 0,6-1,3% ni tashkil qilib, turli mualliflar ma’lumotlariga ko‘ra 300-110 tug‘ilgan bolaga 1 ta to‘g‘ri keladi[5,8,11,12,14,17] va asosan ko‘krak qafasining kosmetik nuqsoni [19], nafas va yurak-qon tomir tizimidagi funksional buzilishlar[8,12,16,17], ularning ruhan tushkunlikka tushishi[4,5,17] bilan tavsiflanadi. SHuning uchun ko‘krak qafasi deformatsiyalarining etiopatogenetik mexanizmlari, ularni tashxislash va ko‘krak qafasing xirurgik rekonstruksiyasi masalalari bolalar xirurgiyasining dolzarb muammolari qatoriga kiradi.

Ko‘krakning old devori nuqsonlari to‘sh, qovurg‘a va mushaklarning zararlanishiga, ko‘krak qafasi shakli va/yoki uning funksiyasini o‘zgarishiga olib keluvchi tuzilmali anomaliyalarni o‘z ichiga oladi. Ushbu anomaliyalar orasida ko‘krak qafasining girdobsimon (KQGD) va kilsimon (KQKD) deformatsiyalari eng ko‘p uchrovchi shakllari bo‘lib, har 300-110 tug‘ilishga 1 nafar to‘g‘ri keladi va alohida nuqsonlar shaklida yoki boshqa genetik sindromlar bilan birga uchrashi mumkin.

KQGD bo‘yicha ilk ma’lumot Bauhinius ga tegishli bo‘lib, 1594 yilda qayd qilingan[17]. Biroq, yaqinda e’lon qilingan tadqiqotga ko‘ra Qadimiy Misrda topilgan 600 ta artefakt taxlili Misr releflaridagi eramizdan oldingi 200 yillarga oid chizmalarda ko‘krak qafasi deformatsiyalari mavjud odamlar shakllari aks etganligi bayon qilingan[5].

Ko‘krak qafasi girdobsimon deformatsiyasi (KQGD) (Pectus excavatum) ko‘krak qafasining old devoridagi tog‘ay qismidagi TQK sining girdobsimon botishi bilan tavsiflanadi[3,4,6,12]. Deformatsiya to‘shning dastasi va tanasi bilan birikish joyidan boshlanib III-VIII qovurg‘alar hamda ularning ravog‘igacha davom etadi.

Ko‘krak qafasining kilsimon deformatsiyasi (Pectus carinatum, «kabutar», «tovuq» ko‘kragi, chicken-breast, keeled chest deformation) to‘sh va unga birikkan qovurg‘alarning oldinga simmetrik yoki asimmetrik qiyshayishi bilan tavsiflanadi[3,4,6,9]. Ushbu holat qovurg‘a tog‘aylarining bir yoki ikki tomonlama zararlanishi, to‘shning esa

yuqori va pastki qismlarida oldinga tomon bo‘rtishi bilan kechuvchi deformatsiyaning bir necha komponentlariga ega bo‘lishi mumkin.

Ushbu nuqsonlar odatda bolalik davrda, ba’zan esa tug‘ilishi bilan tashxislanadi va yosh o‘sib borgan sari, o‘smirlik davriga kelib deformatsiya darajasi ortib boradi[3,17].

Bu deformatsiyaning paydo bo‘lish sababi, mavjud adabiyotlar manbalariga asoslangan holda, oxirigacha ma’lum emasligi aniqlandi. Ko‘pgina mualliflar ma’lumotlari, bu deformatsiyaning displastik - genetik determinatsiyalangan kasallik deb hisoblaydilar[1,3,6].

Cobben JM et all. ma’lumotlariga ko‘ra KQGD barcha deformatsiyalarning 90% ni tashkil qiladi va evropoid irqiga mansub aholida 110 tirik tug‘ilgan chaqaloqlarning birida, ko‘proq o‘g‘il bolalalarda 5:1 nisbatda uchraydi[19]. KQGD ning shakllari alohida uchrashi bilan birga bir oilada bir necha bolalarda ham kuzatilishi mumkin va nosindromal oilaviy turlarida autosom-dominant irsiylikga ega bo‘ladi[2,17].

KQKD esa tarqalish darajasiga ko‘ra ikkinchi o‘rinni egallaydi va har 11 ta tirik tug‘ilgan bolalarning 6 tasida, o‘g‘il bolalar ustunligi 4:1 nisbatda uchraydi. KQGD ning batafsil epidemiologiyasi bo‘yicha ikkita katta tadqiqot o‘tkazilgan. 11-2 yoshli 101 nafar bolalar kogortasida KQKD ning uchrash darajasi 0,675% ni, KQGD ning uchrash darajasi esa 1,17% ni tashkil qilgan[12]. Boshqa tadqiqotda 7-2 yoshli 641 nafar bolalar kogortasida KQKD ning uchrash darajasi 0,6% da, KQGD esa 1,6% da uchraganligi qayd qilingan. Ko‘plab ilmiy nashrlarda KQGD ning boshqa deformatsiyalarga nisbatan sezilarli darajada ko‘p uchrashi keltirilgan bo‘lsa-da, ba’zi ma’lumotlarda buning aksi keltirilgan. Masalan, Argentina va Afrika populyasiyasida KQKD ning girdobsimon deformatsiyaga nisbatan ko‘proq uchrashi Westphal F.L. et all. Ma’lumotlarida keltirilgan[12]. Xuddi shunday tarqalish darajasi to‘g‘risidagi ma’lumotlar turk tadqiqotchilari tomonidan ham qayd etilgan[10]. Janubiy-g‘arbiy Osiyo davlatlari nashrlarida ko‘kraq qafasi deformatsiyalarining uchrash darajasi Eron aholisining umumiy populyasiyasiga nisbatan 1-1,3% ni tashkil qilishi to‘g‘risida ma’lumotlar bayon qilingan[7]. Mazkur nuqson ham alohida anomaliya tarzida yoki qator genetik sindromlarning qismi sifatida shakllanishi mumkin[4,9]. Innes A.M. et all. ma’lumotlariga ko‘ra KQGD va KQKD belgilari bilan keluvchi 31 dan ortiq sindromlar mavjud [9].

Hozirgi paytda ko‘krak qafasi deformatsiyalarining eng ko‘p qo‘llanilayotgan tasnifi M. Torre modifikatsiyasidagi Acastello tasnifidir. Ushbu tasnif patologiyaning 5 ta asosiy turini o‘z ichiga olgan:

1-tur. Qovurg‘alar tog‘ay qismi deformatsiyalari

Ko‘krak qafasining girdobsimon deformatsiyasi;

Ko‘krak qafasining kilsimon deformatsiyasi (1 va 1 turlari).

1-tur. Qovurg‘alarning suyak qismi deformatsiyalari

• oddiy suyak deformatsiyalari (1 yoki 1 ta qovurg‘a rivojlanish anomaliyalari): ageneziya, gipoplaziya, ortiqcha qovurg‘a, qovurg‘aning yorig‘i, birikishi, dismorfizmi, ikkilanishi, kamyob anomaliyalar (doim kompleks ravishda uchraydi);

• murakkab suyak deformatsiyalari (3 va undan ortiq qovurg‘alarning jalb bo‘lishi): ageneziya, gipoplaziya, ortiqcha qovurg‘a, qovurg‘aning yorig‘i, birikishi, dismorfizmi, ikkilanishi, kamyob anomaliyalar (doim kompleks ravishda uchraydi);

• sindromal (doim kompleks ravishdauchraydi): Jene sindromi, serebro-kosto-mandibulyar sindrom, YArko-Levin sindromiva h.

3-tur.Qovurg‘alarningtog‘ayvasuyakqismideformatsiyalari

• Poland sindromi.

4-tur. To‘sh tanasi deformatsiyalari

• to‘shyorig‘i (yurak ektopiyasisiz yoki ektopiyasi bilan);

• Kurrarino-Silvermansindromi

5-tur. O‘mrovvakurakdeformatsiyalari

• o‘mrovning oddiy yoki sindromal anomaliyalari;

• kurakning oddiy yoki sindromal anomaliyalari;

• rivojlanishning kombinatsiyali anomaliyalari.

1-tur. Qovurg‘alar tog‘ay qismi deformatsiyalari:

Ko‘krak qafasining girdobsimon deformatsiyasi to‘shning turli darajadagi botiqligi, va odatda, quyi xondrosternal boylamlar malformatsiyasi bilan birga uchraydi. Bu anomaliya 15% hollarda o‘sish vaqtiga to‘g‘ri keladi. Kechki belgilari ko‘pincha mushak va biriktiruvchi to‘qima patologiyalari bilan birga kechadi (Marfan, Elers-Danlo sindromi va h.)[4,6]. Morfologik jihatdan deformatsiyaning quyidagi variantlari farqlanadi:

1. Grand-Kanon – og‘ir va chuqur girdobsimon deformatsiya bo‘lib, to‘shda

chuqur botiqlik bilan namoyon bo‘ladi. Bunday deformatsiya ayniqsa to‘sh suyaklanishi va o‘ta rotatsiyalanganda bshq varintlrga qaraganda davolashda qiyinchiliklar tug‘diradi va, ko‘pincha asoratlanish darajasining yuqoriligi bilan tavsiflanadi.

1. Kosa shaklidagi deformatsiya – lokal, ko‘pincha simmetrik va to‘shning pastki qismiga aloqado deformatsiya bo‘lib, davolashda qiynchilik tug‘diradi, ko‘pincha qisman korreksiyalanadi.

3. Lagan shaklidagi deformatsiya – bu toifa deformatsiya simmetrik va asimmetrik bo‘lib ko‘krak qafasi oldingi devorini keng botiqligi bilan namoyon bo‘ladi

4. Ko‘ndalang varianti –botiqlik ko‘ndalang bo‘lib, botiqlik to‘shning pastida joylashadi.

5. Ekssentrik variant – botiqlik o‘rta chiziqqa nisbatan ekssentrik joylashadi va doimo asimmetrik bo‘ladi.

6. YAqqol ko‘zga tashlanuvchi girdobsimon deformatsiya – vizual jihatdan yaqqol anomaliya bo‘lib, qovurg‘a yoylari sohasida joylashadi, alohida rivojlanish nuqsoni hisoblanadi

7. Girdobsimon-kilsimon variant – ko‘krak qafasining «cho‘kishi» va parasternal tog‘aylarning bo‘rtishi bilan namoyon bo‘luvchi kombinatsiyalangan malformatsiya. To‘shning pastki qismi me’rda bo‘ladi.

Ko‘krak qafasining kilsimon deformatsiyasi – to‘sh va qovurg‘a tog‘aylari protruziyasi bilan namoyon bo‘luvchi anomaliyadir. Ko‘pincha oilaviy tavsifga ega bo‘lib, biriktiruvchi to‘qima buzilishlari, Nunan[7,19] sindromi va yurak tug‘ma nuqsonlari birgalikda uchraydi. Ushbu nuqson bolalarda odatda girdobsimon deformatsiyadan ko‘ra kechroq, pubertat yoki prepubertat davrda namoyon bo‘ladi, ba’zan esa erta davrlarda ham aniqlanishi mumkin. KQKD si o‘sish davrida tez jadallashib borish xususiyatiga ega. Ba’zi simptomlari girdobsimon deformatsiya belgilariga o‘xshaydi, biroq KQKD da respirator buzilishlardan ko‘ra og‘riq sindromi ustunroq turadi [1, 11]. Kardiorespirator buzilishlar odatda kam rivojlanadi[7,19,23], biroq bemor bolalar og‘ir ruhiy muammolarni boshdan kechiradi va operatsiya ko‘rsatmalarni belgilashda hal qiluvchi omil bo‘lib hisoblanadi.

KQKD joylashuvi va simmetrikligiga ko‘ra quyidagilarga bo‘linadi:

-1-tur – quyi yoki xondrogladiolar turi – eng ko‘p uchrovchi turi bo‘lib, to‘shning quyi yoki o‘rta 1/3 qismi protruziyasi bilan tavsiflanadi. Qovurg‘a yoylari deformatsiyada ishtirok etib, lateral yo‘nalishda ezilga holda bo‘ladi. Odatda simmetrik.

-1-tur – yuqori yoki xondromanubrial turi. Deformatsiyaning ushbu turi Kurrarino-Silverman sindromi uchun xosdir [9]. YUqori turining ikkita varianti mavjud bo‘lib, bir-biridan farqlashni taqozo qiladi. Ko‘pincha sternal segmentlar, manubrio-sternal bo‘g‘imning bitib ketishi va ossifikatsiyasi bilan kechuvchi sternal malformatsiya bo‘lib, quyi 1/3 qismda ken va kalta to‘shning botiqligi bilan kechuvchi simmetrik yuqori deformatsiyadir. YOn proeksiyada to‘sh S-simon ko‘rinishda bo‘ladi. Aynan shu turi adabiyotlarda Kurrarino-Silverman sindromi deb yuritiladi[6].

Ushbu malformatsiyani kilsimon deformatsiyaning yuqori turi sifatida tavsiflash mumkin.

- kilsimon deformatsiyaning boshqa turlari:Lateral yoki bir tomonlama turi – tabiatan asimmetrik bo‘lib, bir tomonlama xondrosternal bo‘g‘im atrofida ba’zi qovurg‘a tog‘aylarining protruziyasi, to‘shning qarama-qarshi tomonga rotatsiyalanishi bilan namoyon bo‘ladi; reaktiv turi– girdobsimon deformatsiyani xirurgik davolashnng asorati sifatida uchraydi va to‘shning ventral tomonga jadal siljishi bilan tavsiflanadi. Ko‘pincha biriktiruvchi to‘qima displaziyasi mavjud bemorlarda vujudga keladi[3,12].

1-tur. Qovurg‘alar anomaliyalari:

Dismorfik tog‘ay turi (nosindromal). Ushbu guruh qovurg‘a tog‘ay qismining turli anomaliyalarini o‘z ichiga olib, ko‘krak devorini bir yoki ikki tomonlama botiqligi bilan namoyon bo‘ladi. Lechenie zaklyuchaetsya v rezeksii xryaща. Bu guruhga yana bir «ko‘krak ichi qovurg‘asi» deb nomlangan kamyob anomaliya kiritilgan bo‘lib, u ham o‘z navbatida bir nechta turlarga bo‘linadi[1,6]:

- I A turi - qovurg‘alar va umurtqa tanasining birikib ketishi;
- I B turi - qovurg‘alarning ajralishi va umurtqa tanasiga zich birikishi;
- II - qovurg‘alarning ajralishi va lateral birikishi;
- III - ajralgan qovurg‘a ko‘krak qafasi ichiga ezib kiradi.

Qovurg‘alar ageneziyasi – kamyob uchrovich nosindromal turi xisoblanib, ko‘krakning sinch vazifasining susayishi tufayli o‘pka churralari vujudga keladi.

3-tur. Xondro-kostal anomaliyalar:

Poland sindromi. 30 ming tirik tug‘ilgan chaqaloqning 1 nafarida uchraydi va ko‘krakning katta mushagi ageneziyasi yoki gipoplaziyasi bilan tavsiflanadi[6,17], ko‘pincha ko‘krak qafasi, qo‘llarning boshqa bir tomonlama anomaliyalari bilan birga keladi[3,12]. 1/3 hollarda nuqson o‘ng tomonlama va o‘g‘il bolalarda uchraydi. Ikki tomonlama zararlanish holati juda kam uchraydi[3,7,10].

4-tur. To‘sh anomaliyalari:

To‘sh yorig‘i – kamyob idiopatik rivojlanish anomaliyasi bo‘lib, embriogenez jarayonida to‘sh birikishining buzilishi tufayli yuzaga keladi. Mazkur nuqsonning uchrash darajasi ko‘krak qafasi tug‘manuqsonlarining 0,15% ni tashkil qiladi[3,11,12]. To‘sh yorig‘i Hox b geni bilan bog‘liq bo‘lishi mumkin[12].

5-tur. O‘mrov-kurak anomaliyalari. Juda kam uchrovchi rivojlanish anomaliyasi[3].

SHunday qilib oxirgi yillarda ko‘krak qafasi deformatsiyalarini uch o‘lchamli modellashtirish va miqdoriy baholashga asoslangan murakkab tasniflar taklif qilinmoqda. SHuningdek tasnifiy belgilarni o‘z ichiga olgan ASFI tasnifi ham taklif qilingan: nuqson turi (Abnormality), deformatsiya simmetrikligi (Symmetry), funksional buzilish turlari (Function) va asosiy baholash indekslari (Indexes). An’anaviy atamalar o‘rniga tashqi belgilarni tavsiflovchi bunday tizimli, miqdoriy tasnifning qo‘llanilishi kelajakda deformatsiyali bemorlarni olib borish va davolash taktikasini belgilash imkonini yaratib beradi.

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Article / Original Paper

RESULTS OF IMMUNE STATUS IN SICK CHILDREN WITH ATOPIC DERMATITIS USING ACUNE REFLEX THERAPY AND EXTERNAL THERAPY

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Annotation. Increasing the effectiveness of the treatment of dermatological patients with atopic dermatitis is an important social task. **Purpose of the study.** To study immunological indicators in children with atopic dermatitis and develop a method of corrective therapy in the process of acupuncture with the use of Broncho-munal. **Materials and research methods**. 32 children with atopic dermatitis aged 12 to 14 years were under observation. **The results of the** studies allow us to conclude that acupuncture has a normalizing effect on the parameters of the humoral link of the immune system of girls with atopic dermatitis. The question arises about the possible mechanisms of such action of acupuncture. **Research results:** The mean values of the levels of immunoglobulins A, G, M in children with atopic dermatitis before treatment did not significantly differ from normal values. An increase in the level of IgG was found in 14 (43.7%) patients. Of particular interest was the study of total IgE in patients with atopic dermatitis. In most patients during the period of exacerbation, a pronounced hyperproduction of IgE was found. The highest average level of IgE was observed in sick children with moderate severity of the disease. **Findings:** In the pathogenesis of sick children with atopic dermatitis, there is a change in the functional activity of the humoral link of immunity, expressed in an increase in the level of serum IgE.

Keywords: atopic dermatitis, acupuncture, immunoglobulins - A, M, G, E.

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Increasing the effectiveness of the treatment of dermatological patients with atopic dermatitis is an important social task. This is due to the significant spread of a number of dermatoses and the severe course of some of them. The traditional methods of treatment currently used in dermatology are far from always effective, and sometimes they themselves are associated with a variety of side effects and complications, sometimes very severe. In this regard, the great interest that is manifested in non-drug methods of therapy is understandable. One of these methods is acupuncture. Atopic dermatitis, a genetically determined chronic allergic disease, is one of the most severe and common dermatoses. First detected in early childhood, it takes a chronic relapsing course and later manifests itself in adults, it is difficult to treat. Therefore, the issue of developing new pathogenetic methods for the treatment of atopic dermatitis is very relevant.

In the pathogenesis of atopic dermatitis, in addition to genetic predisposition factors, one of the leading places is occupied by allergic mechanisms and dysfunction of the humoral immunity factor. However, studies of immunological parameters conducted by numerous authors are often contradictory and often do not have an accurate, complete explanation. So, for example, shifts in some indicators of humoral immunity, in particular the content of serum IgA, IgG, IgM, do not yet find a sufficiently accurate explanation and are sometimes contradictory[1–8]. Among the immunoglobulins detected in significantly elevated concentrations, IgE, which is an important marker of atopic dermatitis, is the most common. Currently, there are many works indicating an increased content of IgE - antibodies in individuals suffering from atopic dermatitis[6], and the pathogenic role of elevated IgE in atopic dermatitis in most authors is not in doubt[6,8]. Functional impairment of the nervous system is of great importance in the pathogenesis of atopic dermatitis. Recent studies confirm the presence of functional disorders in patients with atopic dermatitis, both in the central and autonomic nervous systems, manifested by weakness and inertness of the irritable and inhibitory processes, and a decrease in the mobility of cortical processes. Neurotic disorders are of great pathogenetic significance and aggravate the course of the disease; there is a relationship between the severity of the skin process and functional disorders of the nervous system. A vicious circle is observed: the severe course of atopic dermatitis supports neurotic disorders, and the latter worsen the course of atopic dermatitis. All this suggests that acupuncture occupies a certain place in the treatment of atopic dermatitis, the therapeutic effect of which is based on reflex mechanisms. At the same time, the reaction of the nervous system to

acupuncture consists of three interrelated components: local, segmental and general.

Antiallergic action is a component of the general reaction, acupuncture is carried out in many ways: a normalizing effect on the central nervous system, stimulation of the adrenal cortex, an increase in the content of adrenaline and glucocorticoids in the blood, a decrease in the level of histamine, serotonin and other biologically active substances. The above neurohumoral mechanisms have a significant impact on the development and course of the allergic process.

Materials and methods of research: Under observation were 39 sick children with atopic dermatitis aged 12 to 14 years. The disease in all patients began in childhood and was characterized by manifestations of exudative diathesis, erythema, scales, weeping, periods of exacerbation alternated with periods of remission, and later at the age of 12 a classic picture of atopic dermatitis developed in the form of varying degrees of severity of erythema, flexion lichenification, lichenoid papules, dryness and peeling in the face, neck, upper chest and back, elbow and knee folds, most patients had white dermographism. Severe, biopsy itching was characteristic of all patients. The severity of symptoms varied to varying degrees, with periods of deterioration and remission. Of the concomitant diseases, vasomotor-allergic rhinitis was detected in 1 patient,

To assess the state of the humoral immunity, the concentrations of serum immunoglobulins of classes A, G, M, E were determined in patients. Immunoglobulins of classes A, G and M were determined by the method of radial immunodiffusion proposed by Mancini et all. (1965). The control group consisting of 10 healthy individuals: IgA was equal to - 1.8±0.1 g/l; IgG - 10.7±0.3 g/l; IgM - 1.1±0.04 g/l. The content of IgE was studied using enzyme immunoassay. The indicators of total IgE obtained using the same technique in almost 10 healthy girls (120.0±3.47 IU/ml) were taken as the norm. This method was developed by ABBOTT (USA).

Research results: The mean values of the levels of immunoglobulins A, G, M in children with atopic dermatitis before treatment did not significantly differ from normal values. An increase in the level of IgG was found in 14 (43.7%) patients. Of particular interest was the study of total IgE in patients with atopic dermatitis. In most patients during the period of exacerbation, a pronounced hyperproduction of IgE was found. The highest average level of IgE was observed in sick children with moderate severity of the disease **(Table 1).**

In 7 sick children with a severe form of the disease, the content of IgE in the blood was normal or slightly elevated. These patients had concomitant diseases in the form of allergic rhinitis (1 patient), chronic gastroduodenitis (1), chronic colitis (1). It is possible that in this group of sick girls, the presence of concomitant diseases could affect the production of IgE.

Table-1

Dynamics of the content of total IgE (IU / ml) in blood serum in sick children with atopic dermatitis in the process of acupuncture (M±m)

Group of patients	1st course of treatment		3rd course of treatment	
	Before treatment	After treatment	Before treatment	After treatment
Medium - severe severity n=19	754.6±18.9 P<0.001	850.3±18.3 P<0.001	457.6±16.0 P<0.05	493.2±14.7 P<0.05
Severe severity n = 13	480.3±65.0 P<0.05	582.1±64.6 P<0.05	467.6±68.5 P<0.05	563.4±62.7 P<0.05
Control: n = 10	36.8±3.8	36.8±3.8	36.8±3.8	36.8±3.8

After assessing the immune status, all patients underwent acupuncture by the classical method of irritation, acupuncture points using special needles made of nichrome or silver. Acupuncture points were selected individually, taking into account the clinical picture of the disease and the localization of the skin process. Were used corporal and auricular acupuncture points, during one session - no more than 6 - 7 points. 10-15 daily procedures were prescribed for the course of treatment. Patients received 2-3 courses, depending on the indications.

Repeated courses of acupuncture with a good effect after the 1st course were carried out after 1 month, and in the absence of a pronounced therapeutic effect - after 10 days.

Since in sick children acupuncture was carried out in combination with Emu Oil ointment, a control group of 10 patients with atopic dermatitis, who underwent the same treatment, but without the use of acupuncture, was subjected to an immunological examination.

If we evaluate the results of the use of acupuncture in general, we can conclude that it turned out to be quite effective in the near future. The majority of 28 (87.5%) patients experienced clinical remission, a significant improvement and improvement in their condition. When observed over a longer period of time (from 6 months to 1 year), 22 (68.7%) patients had longer periods of remission than before, exacerbations were of a milder and shorter duration.

After completion of acupuncture, upon reaching a positive effect, a second study of the studied immunological parameters was carried out. The level of serum immunoglobulins of classes A, M remained, as before treatment, within normal fluctuations. In patients with elevated initial IgG levels, there was a tendency to normalize this indicator. Another pattern was observed in the dynamics of the IgE level. In 12 patients, immediately after the 1st course of acupuncture, a statistically significant ($P<0.001$) increase in its level was noted. Before the start of the 2nd course of acupuncture, the IgE level in most patients was lower than the initial level, and at the end of the course it slightly increased again. The same pattern, but more pronounced, was observed in patients by the time of the 3rd course of RT ($P<0.001$).

Thus, after the application of the method of acupuncture during remission in patients with atopic dermatitis, the content of IgE in the blood tended to decrease compared to its initial values. However, normalization of the IgE level was not observed in any case.

The smallest clinical effect of acupuncture was observed in the group of patients with a severe course of the disease and a slightly changed initial level of IgE.

Improvement in their condition occurred only after repeated courses of treatment. Apparently, the high level of total IgE before the start of treatment and after the 1st course of acupuncture, the prognosis was more favorable than its slightly changed indicators.

As a result of conventional treatment without the use of acupuncture, sick children in the control group, along with a slight improvement in the state of the skin process, there was a tendency to a slight decrease in the level of IgE in the blood.

Discussion of the results obtained: The research results allow us to conclude that acupuncture has a normalizing effect on the parameters of the humoral link of the immune system in patients with atopic dermatitis. The question arises about the possible mechanisms of such action of acupuncture. In addition to the known general effects of acupuncture on the human body in the form of stimulation of the function of the adrenal cortex, the central nervous system, a decrease in the level of certain biologically active substances, the possibility of a direct effect of acupuncture on some lymphoid organs through the acupuncture points responsible for them is not excluded. The complex of acupuncture points used in this work included points responsible for the spleen (RP-1, RP-4, RP-6, RP-10), small intestine (IG-3, IG-4, IG-8), point of the front median meridian (I-22), responsible for the thymus. The assumption of such a possible mechanism of the impact of acupuncture on the immune system was also expressed by other authors. This issue can be finally resolved only with further research and observation.

Findings:

1. In the pathogenesis of sick children with atopic dermatitis, there is a change in the functional activity of the humoral link of immunity, expressed in an increase in the level of serum IgE.

2. Acupuncture, being an effective method of treating patients with atopic dermatitis, has a normalizing effect on some altered indicators of the humoral immunity in children with atopic dermatitis.

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Article /Review

INFLUENCE OF ECOLOGICAL CONDITIONS ON THE DEVELOPMENT OF ALLERGIC RHINOSINUSITIS: IMMUNOLOGICAL APPROACH (brief literature review)

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Abstract. The study provides a comprehensive overview of the relationships between environmental conditions and immunology in the context of allergic rhinosinusitis. The work highlights the main findings that reveal the impact of various aspects of the environment on the body's immune mechanisms responsible for the development of this pathological condition.
Analysis of environmental factors, such as air pollution, the presence of allergens, and the influence of climate change, demonstrates their significant impact on human susceptibility to allergic reactions in the rhinosinus region. **The results of the study** reinforce the need for a deeper understanding of the mechanisms of development of allergic rhinosinusitis in order to effectively prevent and treat this disease.
Key words: allergic rhinosinusitis, environmental conditions, immunology, environment, allergens, climate change, development mechanisms, prevention strategies, quality of life, morbidity.

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Введение

В наше время, когда человечество сталкивается с уникальными экологическими вызовами, важно понимать, как окружающая среда влияет на здоровье человека. Экологические условия играют ключевую роль в формировании общественного здоровья и могут оказывать значительное воздействие на различные аспекты физического благополучия. Среди множества заболеваний, которые могут быть связаны с экологическими факторами, особое внимание заслуживает аллергический риносинусит, являющийся одним из наиболее распространенных и влиятельных заболеваний сферы верхних дыхательных путей.

С увеличением индустриализации, изменением климатических условий и урбанизацией, экологические факторы становятся все более сложными и многогранными. Это вызывает растущую обеспокоенность в медицинском сообществе относительно их воздействия на здоровье, включая возможное увеличение частоты и тяжести аллергических заболеваний, таких как риносинусит.

Цель настоящей обзорной статьи — проанализировать и обобщить современные научные данные по влиянию экологических условий на развитие аллергического риносинусита.

Аллергический риносинусит (АРС) представляет собой хроническое воспалительное заболевание слизистой оболочки носа и придаточных пазух, вызванное аллергической реакцией на различные аллергены. Эта патология охватывает широкий спектр клинических проявлений, включая заложенность носа, чихание, насморк и другие симптомы, которые в значительной степени снижают качество жизни пациентов.

В соответствии с данными Всемирной организации здравоохранения, аллергические заболевания, включая аллергический риносинусит, становятся все более распространенными. Аллергия представляет собой глобальную медицинскую и социальную проблему, обусловленную различными факторами, такими как иммунологические нарушения, разнообразие аллергенов, воздействие окружающей среды, изменение климата, стресс, использование лекарственных препаратов, косметики и изменения в рационе питания. Аллергический риносинусит считается наиболее распространенным хроническим респираторным заболеванием, затрагивающим приблизительно 40% населения мира. Дети с наследственной предрасположенностью к атопии чаще проявляют сенсибилизацию к аэроаллергенам, и значительная часть из них развивает клинические проявления респираторной аллергии в раннем возрасте[1,2].

Значимость аллергического риносинусита для общественного здоровья про-

является не только в высокой распространенности, но и в его влиянии на дневную активность, работоспособность и социальные взаимоотношения. Пациенты, страдающие от этого заболевания, часто испытывают снижение качества сна, ухудшение физической активности и повышенную утомляемость, что может привести к долгосрочным последствиям для общественного здоровья и экономики[3].

В свете увеличивающегося воздействия экологических факторов на здоровье человека, важно провести всесторонний анализ взаимосвязи между экологическими условиями и развитием аллергического риносинусита. Это предоставит более глубокое понимание патогенеза заболевания, что, в свою очередь, может сформировать основу для разработки эффективных мер профилактики, диагностики и лечения. В данном контексте, настоящая обзорная статья стремится проанализировать последние научные достижения в области влияния экологических условий на аллергический риносинусит с акцентом на иммунологический подход, что способствует более глубокому пониманию механизмов развития данного заболевания и созданию основы для новых стратегий заботы о здоровье общества[4].

Сложившаяся экологическая обстановка в современном мире ставит перед медицинским сообществом и исследователями вызов не только в понимании последствий, но и в эффективном управлении заболеваниями, связанными с воздействием окружающей среды. В этом контексте, актуальность исследований в области влияния экологических условий на развитие аллергического риносинусита принимает особую значимость.

Существует неопровержимая связь между качеством окружающей среды и здоровьем человека, и именно этот аспект придает нашему исследованию высший приоритет. С ростом индустриализации, загрязнением воздуха, изменением климата и другими экологическими изменениями, которые мы обсудим в последующих разделах, аллергические реакции, включая аллергический риносинусит, становятся более распространенными и тесно связанными с окружающей средой[5].

Экологические факторы, в частности, качество воздуха, имеют существенное влияние на здоровье дыхательных путей и играют ключевую роль в развитии аллергического риносинусита (АРС). Загрязнение воздуха представляет собой сложный микс химических и биологических компонентов, которые, взаимодействуя с органами дыхания, могут провоцировать и усиливать аллергические реакции. Мельчайшие частицы загрязнения воздуха, такие как PM10 и PM2.5, способны проникать глубоко в дыхательные пути. Эти частицы могут содержать аллергены, такие как пыльцу растений или бактерии, что активизирует иммунную систему и может привести к развитию аллергического риносинусита[6].

Аэрозольные аллергены, такие как пыльца, домашняя пыль, и грибковые споры, могут быть не только носителями, но и важными компонентами воздуха. Их вдыхание может провоцировать аллергические реакции, вызывая воспаление в слизистой оболочке носа и придаточных пазухах[7]. Некоторые газы и химические вещества, такие как азотные оксиды, озон и формальдегид, могут оказывать раздражающее воздействие на дыхательные пути и способствовать повышению чувствительности к аллергенам, увеличивая риск развития аллергического риносинусита[8]. Вторичный дым табака содержит токсичные вещества, которые могут усиливать воспалительные процессы в дыхательных путях и быть фактором риска для аллергического риносинусита[9].

Понимание воздействия загрязнения воздуха на дыхательные пути в контексте аллергического риносинусита является важным шагом для разработки превентивных и терапевтических стратегий. Дальнейшие исследования в этой области позволят более точно определить конкретные механизмы и пути воздействия, что, в свою очередь, способствует разработке эффективных мер по снижению влияния экологических факторов на заболевания верхних дыхательных путей.

Аллергены, присутствующие в окружающей среде, играют важную роль в развитии аллергического риносинусита (АРС), представляя собой ключевые стимуляторы иммунных реакций в дыхательных путях. Воздействие этих аллергенов может активировать различные компоненты иммунной системы, приводя к характерным клиническим проявлениям аллергического риносинусита.

Пыльца растений является одним из основных аэрозольных аллергенов, способных вызывать аллергические реакции у человека. Вдыхание пыльцы может привести к активации иммунной системы, вызывая воспаление в слизистой оболочке носа и придаточных пазухах[10]. Состав домашней пыли включает в себя

микроорганизмы, клетки кожи, пух, а также фрагменты насекомых. Эти компоненты могут действовать как мощные аллергены, вызывая реакции у лиц, предрасположенных к аллергическим заболеваниям[11]. Грибковые споры, присутствующие в окружающей среде, могут вызывать аллергический риносинусит у подверженных лиц. Вдыхание этих спор может стимулировать иммунный ответ и способствовать развитию воспалительных процессов.Эпителий и слюна домашних животных, таких как кошки и собаки, содержат аллергены, способные вызывать аллергические реакции. Воздействие этих аллергенов может привести к развитию аллергического риносинусита у чувствительных лиц[12]. Определенные аллергены, такие как травяные и деревянные аллергены, могут быть внесены в помещение с обувью и одеждой, что также может способствовать аллергическим реакциям у лиц, подверженных атопии[13].

Понимание роли аллергенов в окружающей среде в развитии аллергического риносинусита предоставляет основу для разработки стратегий профилактики и лечения. Эффективная идентификация и управление аллергенами могут значительно снизить частоту и тяжесть аллергических реакций, способствуя улучшению качества жизни пациентов, страдающих от аллергического риносинусита.

В последние десятилетия наблюдается значительное изменение климатических условий в различных регионах мира, что оказывает существенное воздействие на здоровье человека, включая распространение аллергических заболеваний, в том числе аллергического риносинусита. Эти климатические изменения могут оказывать воздействие на аллергенную нагрузку, сезонные особенности и длительность аллергических сезонов, вносят коррективы в паттерны распространения биологических аллергенов и формирование иммунного ответа.

Повышение средней температуры воздуха сопровождается изменениями в распределении растительности и времени цветения растений. Это влияет на динамику высвобождения аллергенов, таких как пыльца, что может удлинить сезон аллергических реакций и увеличить их интенсивность[14]. Перемены в атмосферном давлении могут влиять на распространение аэрозольных аллергенов, таких как грибковые споры, в атмосфере. Это может привести к увеличению концентрации аллергенов в воздухе, что способствует усилению аллергических реакций[15]. Изменения в частоте и интенсивности экстремальных погодных явлений, таких как пыльцевые бури и атмосферные изменения, могут создавать условия для более высокой концентрации аллергенов в воздухе, что увеличивает риск развития аллергических реакций[16].

Изменения в климате могут влиять на географическое распределение аллергенных растений, включая расширение их ареалов. Это может привести к появлению новых аллергенов в регионах, где ранее они не были типичными, и создать новые вызовы для обитателей этих областей[17].

Климатические изменения также могут влиять на иммунный ответ человека, делая его более или менее склонным к аллергическим реакциям. Это включает в себя изменения в системе толерантности к аллергенам и регуляциии воспалительных процессов[18].

В свете этих факторов, понимание влияния климатических изменений на распространение аллергических заболеваний, включая аллергический риносинусит, становится ключевым аспектом для разработки адаптивных стратегий заботы о здоровье в условиях меняющейся экологии. В дополнение к этому, углубленные исследования в этой области могут выявить потенциальные точки воздействия для снижения риска развития аллергических реакций и улучшения качества жизни пациентов.

Иммунологический подход к изучению аллергического риносинусита (АРС) обеспечивает понимание того, как реакция иммунной системы на аллергены влияет на развитие и характер данного заболевания. Этот подход углубляет наше знание о молекулярных и клеточных механизмах, лежащих в основе аллергического ответа в риносинусальной области.

Аллергический риносинусит возникает как результат неадекватной иммунной реакции на аллергены, такие как пыльца, домашняя пыль, грибковые споры и другие. Эта реакция характеризуется активацией иммунных клеток, в основном мастоцитов и эозинофилов, что приводит к воспалению в слизистой оболочке носа и придаточных пазухах[19]. После контакта с аллергеном, иммунные клетки, такие как мастоциты, высвобождают медиаторы воспаления, включая гистамин и

лейкотриены. Это приводит к увеличению проницаемости капилляров, отеку слизистой оболочки и выделению слизи, что формирует клинические проявления риносинусита[20]. Эозинофилы, активируемые аллергенами, играют ключевую роль в патогенезе аллергического риносинусита. Их накопление в тканях приводит к характерным изменениям, таким как повышенное количество слизи, эозинофильные инфильтраты и тканевая ремоделирование[21].

В развитии аллергического риносинусита ключевую роль играют аллерген-специфические иммунные ответы. Это включает в себя активацию клеток Т-помощников и образование антител IgE, что создает основу для повторных аллергических реакций[22]. Цитокины, такие как интерлейкин-4 (IL-4) и интерлейкин-5 (IL-5), играют важную роль в регуляции иммунных ответов при аллергическом риносинусите. Эти молекулы способствуют активации и реакции эффекторных клеток, усиливая воспаление[23].

Понимание иммунологических аспектов аллергического риносинусита не только расширяет наши теоретические знания о патогенезе этого заболевания, но и предоставляет новые возможности для целенаправленных методов диагностики и лечения. Иммунотерапия, направленная на модуляцию аллерген-специфических ответов, представляет собой перспективный путь в управлении аллергическим риносинуситом, а глубокие исследования в этой области могут привести к новым инновационным подходам в лечении этого распространенного состояния.

Аллергические реакции в риносинуситах начинаются с воздействия аллергенов на мастоциты в слизистой оболочке носа и придаточных пазухах. Это ведет к дегрануляции мастоцитов и высвобождению медиаторов воспаления, таких как гистамин[24]. Медиаторы воспаления, высвобождаемые мастоцитами, такие как гистамин и лейкотриены, вызывают увеличение проницаемости капилляров в слизистой оболочке. Это приводит к отеку и увеличенному выделению слизи[25].

Активация мастоцитов также приводит к привлечению эозинофилов в область воспаления. Эозинофилы выпускают воспалительные медиаторы и ферменты, что способствует тканевой деструкции и усилению воспаления[23]. Процессы воспаления в риносинуситах активируют высвобождение различных цитокинов и хемокинов, включая интерлейкины и тумор-некрозный фактор. Эти молекулы регулируют воспалительные ответы и участвуют в привлечении и активации иммунных клеток[26]. Повторяющиеся аллергические реакции могут приводить к хроническому воспалению и ремоделированию тканей в слизистой оболочке носа и придаточных пазухах. Это может включать в себя изменения в структуре и функции тканей, что сопровождается длительными симптомами риносинусита[19]. Воспалительные процессы влияют на функциональные аспекты слизистой оболочки, включая мукоцилиарный клиренс, чувствительность к аллергенам и реакцию на раздражители [28]. Воспаление активирует различные компоненты иммунной системы, включая клетки Т-помощники и билинейные клетки, что поддерживает и усиливает аллергический ответ[27].

Понимание роли воспалительных процессов в развитии аллергического риносинусита предоставляет основу для разработки терапевтических стратегий. Модуляция воспалительных ответов может стать ключевым аспектом в лечении и профилактике данного заболевания, и глубокие исследования в этой области могут привести к новым, более эффективным методам управления аллергическим риносинуситом.

Использование иммуногистохимических методов позволяет выявить наличие и распределение клеток и белков, связанных с иммунным ответом, в тканях слизистой оболочки. Это может быть полезным для определения характеристик воспалительных процессов[28].

Измерение уровня иммуноглобулина Е (IgE) в сыворотке крови является ключевым методом диагностики аллергических реакций[29]. IgE является классом антител, который играет ключевую роль в развитии реакций гиперчувствительности I типа и разнообразных проявлений аллергии, таких как аллергическая астма, синуситы, аллергический ринитес, пищевая аллергия, специфические виды хронической крапивницы и атопический дерматит[30].

Анализ на общий IgE может быть использован для определения склонности к аллергическим реакциям, а также для проверки наследственной предрасположенности к аллергии у детей, чьи родители страдают от аллергии. Повышенные уровни IgE в крови могут указывать на наличие аллергенных заболеваний или

реакций на аллергены, такие как пыльца, цветы, шерсть животных и пылью.

Однако стоит отметить, что измерение общего уровня IgE не позволяет определить конкретный аллерген, вызывающий реакцию. Для этого могут быть использованы другие лабораторные исследования, которые помогут определить, какой именно аллерген запускает реакцию[31].

Кожные пробы (прикладные аллергенные тесты) являются распространенным методом для определения аллергических реакций. Они включают в себя нанесение маленьких количеств аллергенов на кожу и наблюдение за реакцией. При прямых кожных пробах аллерген вводят внутрикожно (укол, царапина) или накожно на неповрежденную кожу (в виде капли или аппликации).

Однако стоит отметить, что кожные пробы имеют ряд противопоказаний, включая обострение аллергических и инфекционных заболеваний, случаи анафилаксии в анамнезе, иммунодефицит, тяжелые заболевания внутренних органов. Важно также учитывать индивидуальные особенности организма пациента и определить возможность (или невозможность) проведения диагностических мероприятий, с учетом их возможных последствий для пациента[32].

Иммуноблоттинг (или иммуноблот)-это метод, который позволяет выявлять конкретные белки в аллергенах, с которыми взаимодействует иммунная система. Этот метод может помочь в выявлении аллергенов с высокой точностью. Например, иммуноблоттинг IgE при пищевой аллергии позволяет выявить специфическую сенсибилизацию у пациентов с клиническими проявлениями аллергических заболеваний. Также существуют комплексные исследования, позволяющие определить уровень специфических аллергических антител IgE к наиболее распространенным респираторным и пищевым аллеренам. Эти методы могут быть полезны при диагностике респираторных аллергий, таких как астма, ринит и других респираторных заболеваний[33,34].

Современные молекулярные методы, такие как полимеразная цепная реакция (ПЦР), позволяют идентифицировать конкретные гены и ДНК аллергенов, что может быть полезно для более детального анализа аллергических реакций. ПЦР является «золотым стандартом» для выявления ряда инфекций, позволяя определить наличие возбудителя заболевания, даже если в образце присутствует всего несколько молекул ДНК. Однако, в контексте аллергий, для определения аллерген-специфических антител и уровня иммуноглобулина Е (IgE) в сыворотке крови используются иммуноферментный и радиоиммунный методы. Кроме того, анализ крови на специфические иммуноглобулины Е и кожные пробы (прикладные аллергенные тесты) являются распространенными методами для определения аллергических реакций[35,36].

Анализ уровня цитокинов, таких как интерлейкины и тумор-некрозный фактор, может предоставить информацию о характере воспалительных ответов и уровне активации иммунной системы. Интерлейкины и тумор-некрозный фактор являются ключевыми медиаторами воспаления и иммунного ответа, и их уровень может быть повышен при аллергических реакциях. Например, уровень интерлейкина-6 может быть повышен у пациентов с аллергическим ринитом и астмой. Уровень тумор-некрозного фактора-α также может быть повышен при аллергических реакциях и других воспалительных заболеваниях. Анализ уровня цитокинов может быть полезен для диагностики и мониторинга аллергических заболеваний, а также для оценки эффективности лечения[26,37].

Взаимосвязи между экологическими условиями и иммунологией при аллергическом риносинусите обращают внимание на взаимодействия между различными экологическими факторами и функцией иммунной системы. Загрязнение воздуха, климатические изменения, аллергены окружающей среды, качество воздуха внутри помещений, пищевые аллергены и экологический стресс играют существенную роль в изменении иммунного статуса, активации иммунной системы и увеличении риска аллергических реакций. Экологические условия воздействуют на микроорганизмы в окружающей среде, а их взаимодействие с организмом может влиять на его иммунный статус[38,39].

Экологические аллергены и загрязнители воздуха могут стимулировать высвобождение медиаторов воспаления, таких как гистамин, цитокины и лейкотриены. Эти молекулы активируют и модулируют различные клетки иммунной системы, что способствует аллергическим реакциям[40]. Воздействие пестицидов на иммунитет обусловлено уровнем их влияния на организм, принадлежностью

препаратов к определенной группе химических соединений[41]. Тучные клетки, которые содержат в цитоплазме базофильные гранулы с гистамином и гепарином, принимают участие в развитии аллергических и анафилактических реакций[42].

Окружающая среда оказывает комплексное воздействие на иммунологические механизмы, связанные с аллергическим риносинуситом. Иммуноглобулины, в том числе IgE, подвержены влиянию окружающих факторов, что сопряжено с регуляцией аллергических реакций. Экологические аллергены, такие как пыльца, активируют мастоциты, провоцируя аллергические воспалительные ответы. Генетические факторы взаимодействуют с окружающей средой, определяя склонность к аллергиям, включая гены, регулирующие ответы на аллергены и функцию барьерных тканей. Эпигенетические изменения, вызванные окружающей средой, создают долгосрочные модификации в реакциях иммунной системы. Загрязнение воздуха, повреждая барьерные функции слизистых оболочек, облегчает проникновение аллергенов и активацию иммунных механизмов. Важную роль играет также микробиом окружающей среды, формируя иммунную систему в раннем детстве и воздействуя на дальнейшее развитие аллергических реакций[43,44].

Понимание взаимосвязи между экологическими условиями и иммунологическим ответом предоставляет основу для разработки комплексных стратегий профилактики и лечения. Интеграция различных подходов может обеспечить более эффективное управление аллергическим риносинуситом, учитывая индивидуальные особенности пациентов и окружающую среду, в которой они живут.

Таблица-1

Стратегии профилактики и лечения

Стратегии	Описание
Модификация окружающей среды	Разработка стратегий для снижения уровня загрязнителей в воздухе, контроль за аллергенами в домашней среде и улучшение качества внутреннего воздуха могут снизить воздействие окружающей среды на иммунный ответ и уменьшить риск аллергического риносинусита
Иммунотерапия	Иммунотерапия, включая специфическую гипосенсибилизацию, может быть эффективной стратегией для модуляции иммунного ответа на аллергены. Это может уменьшить чувствительность к аллергенам и снизить тяжесть симптомов.
Фармакологические препараты	Разработка новых фармакологических препаратов, направленных на блокирование или модуляцию специфических молекулярных путей, связанных с аллергическими реакциями, может предложить новые методы лечения и контроля симптомов.
Экосистемные подходы	Поддержание и восстановление биоразнообразия в городских и сельских экосистемах может помочь улучшить качество воздуха и снизить уровень аллергенов, что в конечном итоге окажет положительное воздействие на иммунную систему.
Образ жизни и диета	Профилактические меры, такие как здоровый образ жизни, включая физическую активность, правильное питание и управление стрессом, могут оказать положительное воздействие на общий иммунитет и снизить чувствительность к аллергенам.
Генетическая исследования и персонализированная медицина	Более глубокое понимание генетических факторов, влияющих на реакции на окружающую среду, может привести к созданию персонализированных подходов к профилактике и лечению аллергического риносинусита.
Образование и информирование	Повышение общественной осведомленности о взаимосвязи между экологическими условиями и аллергическими реакциями может способствовать более ответственному отношению к окружающей среде и лучшему управлению рисками.

Заключение

В контексте аллергического риносинусита выявлены следующие ключевые выводы относительно взаимосвязей между экологическими условиями и иммунологией. Взаимодействие этих факторов представляет собой сложную систему, включая аллергены, загрязнители воздуха и изменения климата. Молекулярные механизмы, рассмотренные выше, обогащают понимание того, как окружающая среда влияет на иммунный ответ и способствует развитию аллергического риносинусита. Стратегии профилактики и лечения, основанные на этом взаимодействии, включа-

ют модификацию окружающей среды, иммунотерапию, фармакологические препараты, поддержание биоразнообразия и персонализированные подходы. Решение проблемы требует комплексного подхода, включая образование общества, изменения в законодательстве по охране окружающей среды и инновационные методы диагностики и лечения. Важная роль отводится образованию общества о взаимосвязи между окружающей средой и здоровьем, что может способствовать профилактике аллергического риносинусита и уменьшению воздействия на иммунную систему. Обобщая, дальнейшие исследования в этой области позволят более глубоко понять механизмы развития аллергического риносинусита и разработать эффективные стратегии предотвращения и лечения этого распространенного заболевания.

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Article / Original Paper

COVID-19, DEPRESSİON AND ANXİETY: A STUDY AMONG ADOLOSCENTES

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Abstract. Objective: Our aim in this study was to compare the anxiety students who were studying for national exams and who were not studying for these exams. In addition, it was evaluated whether the exam anxiety of patients who had Covid and those who did not have Covid increased during this period. **Materials and Methods:** The study was conducted in 2022. A total of 100 students were included to our study. Group 1: COVID-19 positive group, group 2: COVID-19 negative control group. School score, BAI and BDI scores were evaluated. **Results:** No significant demographic differences were found between COVID-19-positive and control groups in age, gender, or socio-economic status (p>0.05). The COVID-19 group exhibited higher anxiety levels with a mean BAI score of 24.7±11.4 compared to the control's 15.5±8.80 (p<0.001). Their academic performance was also lower (mean school score: 66.2±20.8) than controls (79.3±18.65, p=0.001). Negative correlations between BAI (r=-0.335, p<0.001) and BDI (r=-0.223, p=0.026) with school scores suggest that higher anxiety and depression are associated with poorer academic outcomes. **Conclusions:** Our study highlights the significant impact of exam stress and COVID-19 on students' anxiety levels and academic performance.

Keywords: Adoloscentes, COVID-19, depression, anxiety, school scores

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Introduction

Adolescence, a phase transitioning from childhood to maturity, often encapsulated between the ages of 10 and 18, represents a period of profound growth and transformation. It is a time marked by deepening peer relationships, burgeoning autonomy in decision-making, and a quest for intellectual and social belonging. This developmental stage, housing over 350 million individuals in the Southeast Asia Region alone, is pivotal in shaping future adults. However, it is also a time laden with challenges, particularly in the academic sphere[1,2].

In countries like India, the pressure on senior secondary and pre-university students is immense, especially for those aspiring to enter competitive fields like medicine. The pursuit of academic success in this context is not just an educational endeavor but a battle against intense competition, with limited seats available in prestigious institutions[3]. This scenario creates a breeding ground for high levels of stress and anxiety, often leading to severe mental health issues, including depression and anxiety, which have been predicted to rise significantly in adolescents[4].

The challenge is further compounded in the context of university education, perceived as one of the most stressful academic pathways. Students face a myriad of stressors including academic burden, peer pressure, high parental expectations, and the physical toll of inadequate sleep. The stress experienced can manifest in various physical symptoms like headaches, fatigue, and emotional disturbances such as anxiety and depression. Alarmingly, the rate of psychological distress and suicide among medical students is notably high, underlining the urgency of addressing these issues[5,6].

Moreover, the advent of the COVID-19 pandemic has exacerbated these challenges. The abrupt shift to online learning, coupled with reduced clinical exposure, has disrupted the traditional educational framework, adding to the stress and anxiety experienced by students. This situation calls for a reevaluation of educational strategies, emphasizing the need for a more holistic approach to address the mental health of students[7].

Our aim in this study was to compare the anxiety students who were studying for national exams and who were not studying for these exams. In addition, it was evaluated whether the exam anxiety of patients who had Covid and those who did not have Covid increased during this period.

Materials and methods

Participants were selected from various high schools, ensuring a balanced representation in terms of age, gender, and socio-economic background. Anxiety and depression levels were assessed using Beck depression inventroy (BDI) and Beck anxiety inventory (BAI). The school score was noted and evaluated. The data collection

was conducted over three months, with assessments done in a controlled environment. The study was conducted in 2022. A total of 100 students were included to our study. Group 1: COVID-19 positive group, group 2: COVID-19 negative control group. For statistical analysis the continues variables were compared using t-test model and the categoric variables with chi-square test via SPSS v27. p<0.05 was considered statistically significant.

Results

A total of 100 students were included to this study. The demographic analysis revealed no significant differences in age between the COVID-19 group (mean age = 15.2±3.1 years) and the control group (mean age = 14.9±3.3 years), with a p-value greater than 0.05. Gender distribution was also similar between the COVID-19 group (60% male and 40% female) and the control group (64% male and 36% female), with no significant differences (p>0.05). Socio-economic status across low, middle, and high categories showed no significant difference between the two groups (p>0.05), with 20% of the COVID-19 group and 18% of the control group being from a low socio-economic status, 64% and 60% from a middle status, and 16% and 22% from a high status, respectively.

When comparing psychological well-being, the mean Beck Depression Inventory (BDI) score for the COVID-19 group was 21.1±10.8, while the control group had a slightly lower mean score of 19.2±10.30, which did not represent a statistically significant difference (p=0.390). However, the Beck Anxiety Inventory (BAI) scores were significantly higher in the COVID-19 group (24.7±11.4) compared to the control group (15.5±8.80), with a p-value of less than 0.001, indicating a significantly greater anxiety level among those who had COVID-19.

The academic impact of COVID-19 was evident in the school scores, with the COVID-19 group having a mean score of 66.2±20.8, which was significantly lower than the control group's mean score of 79.3±18.65 (p=0.001). This suggests that adolescents who contracted COVID-19 experienced a notable decline in academic performance compared to their non-infected peers **(Table 1).**

Table-1

Compariosn of groups

	COVID-19 (n=50)	Control (n=50)	p-value
Age	15.2±3.1	14.9±3.3	>0.05
Gender			>0.05
Male	30 (60%)	32 (64%)	
Female	20 (40%)	18 (36%)	
Socio-economic status			>0.05
Low	10 (20%)	9 (18%)	
Middle	32 (64%)	30 (60%)	
High	8 (16%)	11 (22%)	
BDI score	21.1±10.8	19.2±10.30	0.390
BAI score	24.7±11.4	15.5±8.80	<0.001
School score	66.2±20.8	79.3±18.65	0.001
**** BAI: Beck anxiety inventroy score, BDI: Beck depression inventroy score***			

A negative corellation was found between BAI and school score (p<0.001, r= -0.335). A negative correlation was also found between BDI and school score (p=0.026, r=-0.223) **(Table 2 and Figure 1).**

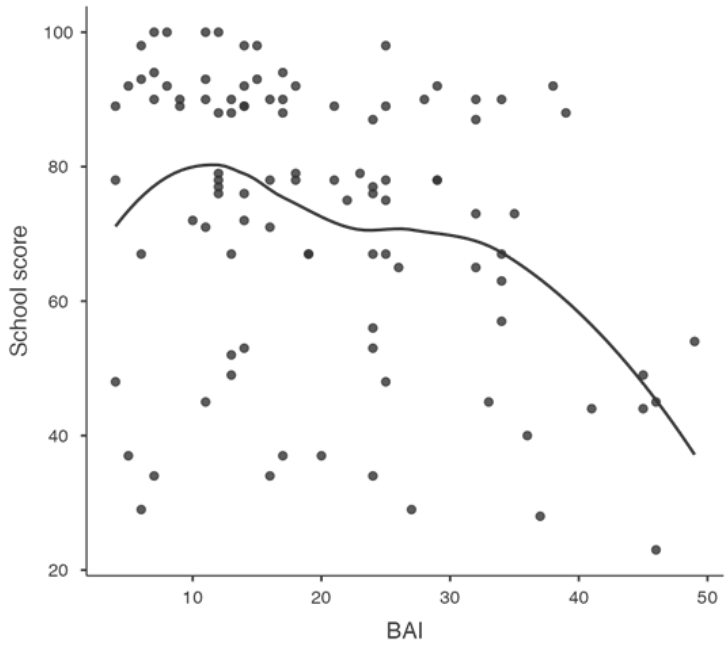
Table-2

Correlation between BAI, BDI, and school score

		BAI	BDI	School score
BAI	Pearson's r	—		
	Df	—		
	p-value	—		
BDI	Pearson's r	0.096	—	
	Df	98	—	
	p-value	0.340	—	
School score	Pearson's r	-0.335	-0.223	—
	df	98	98	—
	p-value	<.001	0.026	—
*** BAI: Beck anxiety inventroy score, BDI: Beck depression inventroy score**				

Figure-1

Negative correlattion between BAI and school score



Discussion

The findings of our study resonate with the literature indicating that adolescence is a critical period characterized by various psychological and developmental challenges. The pre-existing literature suggests that academic pressures, especially in the context of preparing for national exams, can precipitate high levels of stress and anxiety among students[8]. Our study adds to this body of evidence by demonstrating that adolescents who were preparing for national exams exhibited higher levels of anxiety, as measured by the Beck Anxiety Inventory (BAI), compared to those who were not, which is consistent with previous research findings[9].

The increased BAI scores among students who had contracted COVID-19 in our study are in line with the global observations of heightened anxiety levels during the pandemic. The shift to online learning and the uncertainty surrounding the pandemic have been shown to exacerbate stressors, especially in the educational context[10]. This disruption has likely contributed to the observed increase in anxiety levels in the COVID-19 positive group.

Interestingly, our study did not find a significant difference in Beck Depression Inventory (BDI) scores between the COVID-19 and control groups, suggesting that while anxiety levels were affected, depression may not have been significantly impacted. This could be due to various coping mechanisms or resilience factors not measured in this study but noted in the literature as protective against depression during stressful times[11].

The significant negative correlation between both BAI and BDI scores and school scores underlines the impact of psychological well-being on academic performance. Previous studies have documented the detrimental effects of high anxiety and depression levels on cognitive functions and academic achievements[12]. Our findings further support the notion that psychological distress can compromise students' academic outcomes, as those with higher BAI scores had notably lower school scores.

The decrease in school scores among students who had COVID-19 could reflect the direct impact of the illness, the associated psychological distress, or the disruption to their academic routines. This aligns with research suggesting that health-related school absenteeism can adversely affect academic performance[13].

Given the high rates of psychological distress and its correlation with academic performance, as well as the additional burden imposed by the COVID-19 pandemic, there is an urgent need to address mental health in the academic setting. Interventions such as counseling, stress management programs, and a supportive educational environment can be instrumental in mitigating the adverse effects of exam stress and pandemics on students' mental health and academic success[14–16].

The limitations of this study include the cross-sectional design, which does not allow for causal inferences, and the reliance on self-reported measures, which may be subject to bias. Future research should consider longitudinal designs to track changes over time and include objective measures of academic performance.

In conclusion, our study highlights the significant impact of exam stress and COVID-19 on students' anxiety levels and academic performance. It underscores the need for comprehensive strategies to support adolescent mental health and well-being, especially during times of global crisis.

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Article / Review

PREDICTORS OF THE DEVELOPMENT OF RECURRENT BRONCHIAL OBSTRUCTION IN CHILDREN

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Abstract. Purpose of the study: to determine the significance of risk factors for the development of recurrent bronchial obstruction in children. **Material and methods of research.** A total of 240 children were examined and divided into 3 groups: Group I - patients with acute obstructive bronchitis (AOB), acute bronchiolitis (ABL), Group II - children with recurrent obstructive bronchitis (ROB) and bronchial asthma (BA), Group III - patients with acute bronchitis without bronchial obstruction (BA). To assess the significance of risk factors for the development of recurrent and relapsing course of BOS, we analysed genealogical, biological and social anamnesis, premorbid and family background, in children of the studied groups, characterising the state of family health and features of child development in the ante- and postnatal periods, as well as in the first years of the child's life. **Results of the study and discussion.** When studying the causes and factors influencing the development and course of BOS in children, the most important is the study of background diseases that aggravate and prolong the course of bronchial obstruction. The study of pre-mobilisation background in patients of the compared groups showed that a number of factors were significantly more frequent in patients with acute and recurrent course of bronchobstructive syndrome. **Conclusions.** It was found that the risk factors for the development of recurrent course of bronchial obstruction in children are: artificial feeding (P<0.002; OR=4.80), rickets (P<0.02; OR=2.15), overweight (P<0.002; OR=5.40), atopy (P<0.001; OR=18.32), first episode of BOS before the age of 1 year (P<0.002; OR=3.01), absence of fever (P<0.002; OR=12.95) and catarrhal syndrome (P<0.001; OR=60.0) during the episode of illness.

Key words: bronchoobstructive syndrome, predictors, children.

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Introduction. Bronchial obstructive syndrome (BOS) is a collective term encompassing a specific set of clinical manifestations indicating impairment in bronchial patency, primarily characterized by the constriction or occlusion of the airways[1]. According to literature data, the prevalence of bronchial obstructive syndrome among infants ranges from 12 to 23% in the first year of life, while among preschool-aged children in European countries, it stands at 12.35%, and in Latin American countries, it reaches 19.27%.

In the presence of an aggravated medical history, this indicator can range from 35% to 55%. According to literature findings, wheezing and dyspnea have been identified in 50% of children at least once in their lives, while a recurrent course of BOS characterizes 25% of children[2]. The high incidence of BOS is largely influenced by predisposing anatomical and physiological features in young children. Among these features, prominent factors include the presence of glandular tissue hyperplasia, the predominance of viscous sputum secretion, relative airway narrowness, reduced smooth muscle volume, limited collateral ventilation, inadequate local immunity, and a flattened diaphragm dome[3]. Bronchoobstructive syndrome in early childhood, occurring against the backdrop of acute lower respiratory tract infections, is found in 5-40% of cases. In children with an aggravated history of allergies or frequent illnesses (more than 6 cases of acute respiratory infection in a year), this syndrome is detected in 30-40% of cases[4,5]. Allergic diseases or a hereditary predisposition to atopy have been demonstrated as risk factors for BOS development in children[6]. Premorbid factors contribute to the onset of BOS, including pregnancy toxemia, complicated labor, birth hypoxia, prematurity, maternal history of allergies, thymus hyperplasia, cerebral ischemia, and early artificial feeding[7].

The results of published studies on the diagnostic value of the recurrent course in children with recurrent bronchoobstructive syndrome are conflicting. A priority in diagnosing BOS involves seeking prognostic markers – predictors of predisposing factors in the formation of the disease. Consequently, scientific research in this direction will significantly enhance the specificity and effectiveness of diagnostic and preventive measures.

Purpose of the study: to determine the significance of risk factors for the

development of recurrent bronchial obstruction in children.

Material and methods of research.

A total of 240 children were examined and divided into 3 groups: Group I - patients with acute obstructive bronchitis (AOB), acute bronchiolitis (ABL), Group II - children with recurrent obstructive bronchitis (ROB) and bronchial asthma (BA), Group III - patients with acute bronchitis without bronchial obstruction (BA). To assess the significance of risk factors for the development of recurrent and relapsing course of BOS, we analysed genealogical, biological and social anamnesis, premorbid and family background, in children of the studied groups, characterising the state of family health and features of child development in the ante- and postnatal periods, as well as in the first years of the child's life.

Statistical processing of the obtained data was carried out using the package «SPSS Statistics 26.0.0» for Windows by SPSS Inc. & Microsoft Office Excel, 2019.

Results of the study and discussion.

When studying the causes and factors influencing the development and course of BOS in children, the most important is the study of background diseases that aggravate and prolong the course of bronchial obstruction. The study of pre-mobilisation background in patients of the compared groups showed that a number of factors were significantly more frequent in patients with acute and recurrent course of bronchobstructive syndrome.

Thus, artificial feeding was significantly more frequent in group I patients compared to patients without bronchoobstructive syndrome ($\chi 2$ =13.740; P=0.0001; OR=2.22), and artificial feeding was even more frequent in patients with recurrent obstructive bronchitis and bronchial asthma compared to group III patients ($\chi 2$ =28.399; P=0.0001; OR=4.80). Such a difference in the type of feeding of patients seems to be related to the direct protective effect of breast milk in the development of bronchoobstructive syndrome, as a result of an increase in the level of antibodies to various viral-bacterial associations, as well as normalisation of both humoral and cellular immunity.

An important role in the development of bronchial obstruction in children belongs to various vitamin-D deficiency states, including rickets of various severity degrees, which was confirmed by our study of premorbid background in children. Thus, rickets was significantly more frequent in group II patients as compared with patients with OOB, OBL ($\chi 2$ =5.45; P=0.033; OR=2.13). A significantly higher proportion of rickets in premorbid was found in group II patients as compared to group III ($\chi 2$ =11.75; P=0.001; OR=4.58). The study showed that overweight can be considered as a risk factor for recurrent course of bronchobstructive syndrome, as this feature was significantly more frequent in patients with ROB, BA in comparison with patients with OOB, OBL ($\chi 2$ =6,74; P=0,016; OR=0,76). Overweight was also 2 times more common in patients with ROB, AD compared with patients with OPD, which showed a statistically significant difference ($\chi 2$ =5.10; P=0.0028; OR=1.99).

The study of premorbid background showed that in patients with acute and recurrent course of bronchobstructive syndrome the presence of concomitant allergic diseases prevails, so in patients of group II this factor was significantly more frequent in comparison with patients of group III ($\chi 2$ =14,00; P<0.001; OR=3.90), and in group I patients concomitant allergic pathologies were also observed almost twice as often in comparison with patients without bronchial obstruction manifestations ($\chi 2$ =5.03; P=0.027; OR=1.98).

The presence of «maternal atopy only» was significantly more frequent in patients with recurrent obstructive bronchitis and bronchial asthma compared with patients with acute bronchitis without bronchial obstruction ($\chi 2$ =4.01; P=0.050; OR=3.07), while this factor had no significant differences in group I patients compared with group III patients ($\chi 2$ =1.93; P=0.146; OR=1.97) and with group II patients ($\chi 2$ =0.72; P=0.429; OR=0.75). At the comparative analysis of the feature «atopy only on the father's line» a similar characteristic was noted, so this indicator was significantly more frequent in patients with recurrent obstructive bronchitis and bronchial asthma in comparison with patients without bronchoobstructive syndrome, at the same time this factor had no significant differences in patients of groups I and II. The study showed that the presence of atopy in the family history on the line of both parents was significantly more frequent in patients with OOB, OBL in comparison with patients from group III ($\chi 2$ =20,10; P<0.001; OR=9.83), and more than 9 times more frequently in patients with recurrent obstructive bronchitis and bronchial asthma compared with group III patients ($\chi 2$ =29.22; P<0.001; OR=18.32). When this factor was compared between patients of groups I and II, no significant differences were

found (χ2 =3.01; P=0.084; OR=0.49).

Thus, in patients with an episode of bronchial obstruction, only one third of patients had no family history of atopy in relatives, which was significantly lower compared with patients with bronchitis without bronchobstruction (χ2 =28.04; P<0.001; OR=0.19), an even greater difference was observed in the comparative analysis of this indicator in patients of groups II and III, namely, patients with recurrent obstructive bronchitis and bronchial asthma had 9 times fewer cases of absence of atopy in relatives compared with patients with acute bronchitis (χ2 =55.09; P<0.001; OR=0.02). When this criterion was compared between patients in groups I and II, there was also a significant difference (χ2 =12.22; P<0.001; OR=4.95).

Absence of catarrhal manifestations was noted in 2/3 of ROB and AD patients, which was significantly more frequent in comparison with the indicators of groups I and III (χ2 =32.00; P<0.001; OR=0.13), (χ2 =53.00; P<0.001; OR=59.00), it was also found that in group I patients this sign was significantly more frequent in comparison with group III patients (χ2 =12.11; P=0.001; OR=9.01). Thus, the absence of catarrhal phenomena during BOS is a symptom predisposing to the development of repeated and recurrent forms of bronchial obstruction.

Conclusions. It was found that the risk factors for the development of recurrent course of bronchial obstruction in children are: artificial feeding (P<0.002; OR=4.80), rickets (P<0.02; OR=2.15), overweight (P<0.002; OR=5.40), atopy (P<0.001; OR=18.32), first episode of BOS before the age of 1 year (P<0.002; OR=3.01), absence of fever (P<0.002; OR=12.95) and catarrhal syndrome (P<0.001; OR=60.0) during the episode of illness.

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THE IMPORTANCE OF MODIFIED BRONCHOPHONOGRAPHY IN THE DIAGNOSIS OF RECURRENT BRONCHOOBSTRUCTIVE SYNDROME IN CHILDREN

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Abstract. Purpose of the study: to establish the diagnostic and prognostic significance of modified bronchophonography in bronchobstructive syndrome in children. Material and methods of research. The paper presents the results of examinations of children with bronchoobstructive syndrome. The patients were divided into 3 groups of 60 patients: Group I - patients with acute obstructive bronchitis (AOB), acute bronchiolitis (ABL), Group II - children with recurrent obstructive bronchitis (ROB) and bronchial asthma (BA), Group III - patients with acute bronchitis without bronchial obstruction (BA). **Results of the study and discussion.** Analysis of modified bronchophonography indices in groups I-II showed that on admission, E:I index>1.6 indicating bronchial obstruction of the II degree (P<0.001). On the 2nd day of observation, E:I index significantly decreased in patients with ROB, BA and was significantly lower in comparison with indices of patients with OOB, OBL (P<0,05). On the 3rd day of observation and at discharge, the indices were relatively equal, no significant difference was observed (P>0.2; P>0.1). When constructing the ROC-curve and analysing the curve coordinates, it was found that in determining the risk of ROB and AD in children, the diagnostic significance of the E:I index≥1.78, with a sensitivity of 71.7% and specificity of 61.1%. **Conclusions.** The values of E:I index≥1.78 are predictors of the risk of ROS and BA development, the diagnostic significance of which is confirmed by high sensitivity and specificity, which can be recommended for detecting the risk of recurrent course of BOS in children.

Key words: bronchoobstructive syndrome, modified bronchophonography, children.

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Relevance.

The diagnosis of lung diseases heavily relies on acoustic methods for examining the respiratory system. However, a significant drawback lies in the subjectivity and absence of universally accepted standards for evaluating auscultatory data[1,2].

Airway obstruction stands as a crucial clinical characteristic in pediatric respiratory diseases[3,4], diagnosed through the study of lung function. Yet, this examination poses challenges in young children[5].

Respiratory acoustics represents a scientific field primarily focused on developing objective acoustic techniques to diagnose lung diseases. This development is rooted in the theory of sound propagation and generation within the lungs[6].

The evaluation of external respiratory function is a vital method for assessing and monitoring the bronchopulmonary system in children. However, in young children, it is significantly hindered by the difficulty in establishing productive contact with the patient. Consequently, efforts have been made to propose new investigation methods that do not require active participation from the patient[7,8]. Among the commonly used methods for assessing external respiratory function are spirometry and peak flow measurement[1,4].

The objective analysis of lung acoustics has been facilitated by the advent of computerized techniques for recording and processing respiratory sounds[9]. This method has demonstrated notable advantages over traditional auscultation, significantly enhancing the diagnostic capabilities for various lung diseases, notably bronchoobstructive syndrome in pediatric patients[10,11].

Bronchophonography, a technique employed to assess respiratory patterns by graphically representing phonorespirograms derived from respiratory noise spectrograms, holds promise in this domain[4]. Its capacity to register acoustic manifestations adds value to the differential diagnosis of respiratory ailments in children, particularly in discerning bronchobstructive syndrome, a critical concern in early childhood.

The prevalence and recurrent nature of bronchial obstruction syndrome in preschool children, often accompanying acute respiratory infections, continue to engender significant scientific interest due to diagnostic complexities[12,13].

Assessing external respiratory function in children below five years old is

constrained by their inability to execute forced maneuvers. Consequently, the increasing adoption of computer bronchophonography in pediatric practice reflects its utility in this population[2,14].

Purpose of the study: to determine the diagnostic and prognostic relevance of modified bronchophonography in children affected by bronchobstructive syndrome..

Material and methods of research.

The study presents examination results of children hospitalized for various respiratory conditions: acute bronchitis, acute and recurrent obstructive bronchitis, acute bronchiolitis, and bronchial asthma complicated by Bronchial Obstruction Syndrome (BOS). These investigations were conducted during inpatient care at the Pulmonology and Pediatric Intensive Care Units of the Samarkand Regional Children's Multidisciplinary Medical Center from 2020 to 2023.

Patients were categorized into three groups: Group I comprised patients with acute obstructive bronchitis (AOB) and acute bronchiolitis (ABL), Group II consisted of children with recurrent obstructive bronchitis (ROB) and bronchial asthma (BA), while Group III involved patients with acute bronchitis without bronchial obstruction (BA).

Assessment of bronchial obstruction severity in children utilized the modified bronchophonography method[15] through the calculation of the Expiration-to-Inspiration (E:I) index. This technique involves a respiratory noise recording system and software for data analysis on a personal computer. The E:I index was determined using the formula: E:I index = exhalation (ms)/inhalation (ms). Importantly, this modified bronchophonography method was applied across all age groups and patient conditions.

The degree of respiratory dysfunction in Bronchoobstructive Syndrome (BOS) was evaluated using the Respiratory Distress Assessment Instrument (RDAI) scale developed by Lowell DI et al.[10]. Additionally, a saturation-scale estimation was calculated using the formula:

SSO = (95 - SpO2) + RDAI, where SpO2 represents the patient's saturation index.

Statistical analysis of the collected data was conducted using the «SPSS Statistics 26.0.0» package for Windows by SPSS Inc. and Microsoft Office Excel 2019.

Results of the study and discussion.

The analysis of modified bronchophonography parameters in Groups I-II (Table 1) revealed that upon admission, an E:I index >1.6 indicated a second-degree bronchial obstruction (P<0.001). By the 2nd day of observation, there was a significant decrease in the E:I index among patients with ROB and BA, showing notably lower values compared to patients with OOB and OBL (P<0.05). However, by the 3rd day of observation and upon discharge, the indices were relatively similar, showing no significant differences (P>0.2; P>0.1).

Table-1

E:I index as a function of follow-up time in patients of groups I-III

№	Observation Time	Group I		Group II		Group III		P1	P2	P3
		M	m	M	M	M	m			
1	Admission	1,69	0,03	1,92	0,04	1,08	0,01	<0,001	<0,001	<0,001
2	2nd day	1,58	0,03	1,50	0,04	1,03	0,01	<0,05	<0,001	<0,001
3	3rd day	1,39	0,04	1,45	0,05	1,05	0,01	>0,2	<0,001	<0,001
4	Discharge	1,17	0,02	1,18	0,02	1,02	0,01	>0,1	<0,001	<0,001

Note: P1, P2, P3 indicate the reliability of differences between Groups I and II, I and III, II and III, respectively.

The analysis of modified bronchophonography in patients from Groups I and III revealed significantly higher E:I index values in patients with OPD and OBL compared to those with OP, both upon admission and during follow-up (P<0.001). Simultaneously, patients in Group III with OP but without bronchial obstruction exhibited E:I index values within the normal range, confirming the absence of bronchial patency disorders.

A similar trend in modified bronchophonography parameters was observed in patients from Groups II and III. Patients with ROB and AD consistently displayed significantly higher E:I index values compared to those with ED across all stages of dynamic observation, confirming statistical significance (P<0.001).

The saturation-scale assessment, reflecting the severity of respiratory disorders and blood oxygen saturation, was conducted upon admission and throughout the disease progression in patients.

The dynamic indices in patients from Groups I-II (Table 2) indicated higher SSO data upon admission in Group II compared to Group I (P<0.05), suggesting a more pronounced degree of respiratory disorders in patients with ROB and BA. However, these values equalized between the studied groups on the 2nd and 3rd days (P>0.5).

Table-2

SSO index depending on follow-up time in patients of groups I-III

№	Observation Time	Group I		Group II		Group III		P1	P2	P3
		M	m	M	M	M	m			
1	Admission	10,44	0,37	11,89	0,44	2,49	0,19	<0,05	<0,001	<0,001
2	2nd day	9,04	0,37	8,85	0,42	2,13	0,15	>0,5	<0,001	<0,001
3	3rd day	7,44	0,33	7,43	0,39	1,48	0,17	>0,5	<0,001	<0,001
4	Discharge	3,79	0,19	4,68	0,31	0,91	0,0	<0,05	<0,001	<0,001

Note: P1, P2, P3 denote the reliability of differences in indicators between Groups I and II, I and III, II and III, respectively.

Upon hospital discharge, patients in Group II maintained a relatively high SSO score (P<0.05).

The examination of SSE in patients from Groups I and III revealed a fourfold higher SSE upon admission in Group I compared to Group III (P<0.001). This discrepancy indicated pronounced respiratory disorders in patients with APS and OBL compared to those with OB. This trend persisted throughout the dynamic follow-up (P<0.001).

A similar disparity in SSE was observed between patients in Groups II and III. Upon admission, SSE was higher in Group II compared to Group III (P<0.01), signifying a comparatively heightened degree of respiratory distress in patients with ROB and AD, a distinction that persisted in subsequent days (P<0.001).

By constructing the ROC curve and analyzing the curve coordinates (Table 3), it was determined that an E:I index value ≥1.78 bears diagnostic significance in identifying the risk of ROB and AD in children, exhibiting a sensitivity of 71.7% and specificity of 61.1%.

Table-3

Diagnostic value of E:I index grades in children with AD and ROB

Curvilinear coordinates		
E:I index	Sensitivity	1 - Specificity
1,7240	0,605	0,235
1,7340	0,619	0,252
1,7440	0,677	0,269
1,7540	0,685	0,319
1,7640	0,685	0,352
1,7740	0,719	0,385
1,7850	0,725	0,419

Conclusively, the present study underscores the significance of the E:I index as a pivotal marker in assessing the risk of developing ROB and AD.

Abstract: The analysis of respiratory system functional indices among patients in Groups I-III, utilizing modified bronchophonography and saturation-scale assessment, highlights the importance of investigating the E:I index to delineate the course of bronchial obstruction in children and predict subsequent BOS episodes.

The recurrent pattern of BOS manifests with a considerable prolongation of exhalation compared not only to ROB (P<0.001) but also to acute BOS in children (P<0.001). This observation confirms a notable impairment of bronchial patency in patients with ROB and BA, as indicated by the E:I index.

Conclusions: E:I index values ≥1.78 serve as predictive indicators for ROS and BA development, supported by their diagnostic significance characterized by high sensitivity and specificity. These findings suggest the E:I index as a valuable tool for identifying the risk of recurrent BOS in children.

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