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TREATMENT OF UPPER RESPIRATORY TRACT BACTERIAL INFECTIONS IN CHILDREN WITH BACTERIOPHAGE

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ზედა სასუნთქი გზების ბაქტერიული ინფექციების მკურნალობა ბაქტერიოფაგით ბავშვთა ასაკში

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რეზიუმე

კვლევის მიზანს წარმოადგენს ფაგოთერაპიის ეფექტურობის შეფასება ზედა სასუნთქი გზების ბაქტერიული ინფექციების მქონე ბავშვებში. კვლევა არის პროსპექტული, ლია, კონტროლირებადი, ჩატარდა 2021- 2023წ.წ. თბილისის სახელმწიფო სამედიცინო უნივერსიტეტის გ. ჟვანიას სახელობის პედიატრიულ აკადემიურ კლინიკაში. შესწავლილი იყო 108 ლაბორატორიულად დადასტურებული ზედა სასუნთქი გზების მწვავე ბაქტერიული ინფექციების /J03.0 მწვავე სტრეპტოკოკული ტონზილიტი, J02.0 მწვავე სტრეპტოკოკული ფარინგიტი/. მქონე ამბულატორიული პაციენტის კლინიკური და პარაკლინიკური მონაცემები. შემთხვევითი შერჩევის მეთოდით პაციენტები დაიყო თანაბრად ძირითად და საბაზისო ჯგუფებად. ძირითადი ჯგუფის პაციენტებს უტარდებოდათ ბაზისური ანტიბიოტიკოთერაპია და დამატებით ღებულობდნენ პერორალურად ბაქტერიოფაგს. საკონტროლო ჯგუფში კი გამოყენებულ იყო მხოლოდ ანტიბიოტიკი.

მიღებული შედეგების სტატისტიკური ანალიზის შედეგად დადგინდა ფაგოთერაპიის ეფექტურობა ზედა სასუნთქი გზების ბაქტერიული ინფექციების მართვაში პედიატრიულ პრაქტიკაში. აღნიშნულის გათვალისწინებით ვფიქრობთ, რომ მიზანშეწონილია კლინიკური კვლევების გაფართოვება.

Introduction: The incidence and lethality with bacterial infections in Georgia as in others countries, still remains high and it is one of the main reasons for medical facilities. Especially, Infections caused by the multi-drug resistant bacteria present one of the most global problems of the contemporary medicine [1,2]. For basic etiologic treatment of bacterial infections is antibiotics. Inappropriate and high use of antibiotics is a significant problem all of the World. In 2011, the World Health Organization recognized antimicrobial resistance and prevention of nosocomial infections as a priority [1,2].

Antibiotic resistance is increasing alarmingly and in 2050 more then 10 million deaths due to antibiotic-resistant infections may occur [3]. Bacteriophages are one of the most promising alternatives to antibiotics for clinical use [4]. Recently the interest in bacteriophages as a possible alternative to antibiotics or as an adjuvant to antibiotic therapy has been increased [5]. It is established that bacteriophage is a virus that destroys bacterial cells, has a specificity to certain strains of bacteria [6].

The bacteriophage tail contains enzyme depolymerase. It breaks the exopolysaccharide membrane of bacteria. Nowadays, it is not perfectly studied how bacteriophage helps antibiotics to destroy bacteria

without biofilm. However, there is an opinion that bacteria without biofilm is more effectively destroyed by antibiotics [6,7].

Scientific works in this regard is very few. The bacteriophage can replication in bacterial cells. It persists in bacterial cells until their reactivation and subsequent bacterial cell lysis [8,9]. Forming biofilm is a universal phenomenon and plays a major role in antibiotics resistance [6]. This is the reason why our research, which is dedicated to the effectiveness of bacteriophages in bacterial infections, is relevant. It will give us an opportunity a gust the mechanism of action of bacteriophage and this can be established.

Aim of our study was to evaluating the effectiveness of bacteriophage therapy in children with upper respiratory tract bacterial infections. We hypothesized that bacteriophages Inclusion in complex antibacterial treatment is characterized by positive therapeutic efficacy.

Methods and materials: This prospective study was conducted from march 2021 to December 2023 in Tbilisi state medical university G.Zhvania Pediatric Academic Clinic. 108 bacteriologically confirmed patients with upper respiratory tract infections /J03.0 Acute streptococcal tonsillitis , J02.0 Acute streptococcal pharyngitis/ between 3 and 7 years old were surveyed. The proportion of males is 52/48.2%/ and that of females is 56/51.8%/. Patients were stratified into two groups: basic and control, the same according to age and gender. Basic group-54/50%/ children have treated with antibiotic and symptomatic treatment plus commercial bacteriophage preparations administered per os. Control group- 54/50% children treated only with antibiotic and symptomatic treatment.

This open clinical trial was carried out in accordance with the Case Control Study design. All patient's anamnesis data and clinical-paraclinical markers have studied. Clinical and paraclinical markers specific for different diseases and integrated index of the gravity of condition. defined by the method of multicriterial analysis with usage of Fuzzy logic approaches were revealed in dynamics [10].

Results: The analysis of data from 108 patients was done before and on the fifth-seventh day of treatment. Table N1 includes clinical and laboratory data for upper respiratory tract infections in the basic and control groups.

Table 1. Clinical manifestations and laboratory data of children with streptococcal pharyngitis (J02.0)

N	Symptom/laboratory data	basic group			control group		
		Before Treatment	on the fifth-seventh day of treatment	Average duration of clinical symptoms	before Treatment	on the fifth-seventh day of treatment	Average duration of clinical symptoms
1.	Fever	70,0±12,2%	30,0±13,5%	2,1±0,3	72,0±8,4%	40,5±13,4%	3,5±0,4
2.	Sore throat	46,6±12,4%	0	2,3±0,7	45,0±12,4%	10,2±8,4%	3,1±0,8
3.	discharge from the nose	36,6±12,4	10,2±12,4%	3,3±0,9	38,0±11,4%	12,2±8,9%	4,1±0,8
4.	Cough	26,6±12,4	9,2±11,4%	3,8±1,9	27,0±11,4%	11,2±7,9%	4,2±0,3
5.	Fatigue	16,6±11,4	0	1,8±0,9	17,0±11,2%	3,2±2,9%	1,2±0,2
6.	Leukocytosis	82,0±10,2%	28,1±11,5%		81,0±9,4%	31,2±12,4%	
7.	Neutrophilosis	72,0±11,2%	26,1±10,5%		71,0±9,4%	30,2±13,4%	
8.	Increase C-reactive protein /mg/L/	52,0±11,2%	18,1±10,5%		53,0±10,4%	25,2±12,6%	
9.	Increase Erythrocyte Sedimentation Rate/mm/h/	62,0±11,2%	38,1±11,5%		61,0±7,4%	40,2±10,4%	

Discussion: We performed a clinical trial on bacteriophage effectiveness in children. It was established that by peroral treatment with commercial bacteriophages the positive trends of investigated parameters had place. Our data is same other authors [11].

Our data shows that clinical and laboratory paternity testing has a significant effect on the incidence of bacterial upper respiratory tract infections in children aged 3 to 7 years. Bacteriophages and antibiotics were used in comparison to patients who were treated solely with antibiotics. There was no information on the contraindications for bacteriophage therapy in pediatric populations.

Conclusions: Further investigation is needed for the use of bacteriophage therapy in children. We suggest obtaining more convincing evidence of the clinical value of bacteriophagetherapy. Further studies should be conducted in a larger number of patients using the generally accepted double-blind method.

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SUMMARY

The study aims to assess the efficacy of bacteriophage therapy in pediatric patients with upper respiratory tract bacterial infections. The study is a prospective, open, controlled trial undertaken from 2021 to 2023 at the Pediatric Academic Clinic of Tbilisi State Medical University named after G. Zhvania.

A total of 108 patients were enrolled in the trial, comprising 54 in the main group and 54 in the control group. The participants were youngsters aged 3-7 years, with 52 males (48.2%) and 56 females (51.8%). Clinical diagnosis includes acute streptococcal tonsillitis (62 cases) and acute streptococcal tonsillitis (46 cases). Both the main and control groups had an equal distribution. Patients in the basic group received both standard antibiotic therapy and oral bacteriophage. In the control group, only antibiotics were administered.

The collected findings were statistically analyzed utilizing Fuzzy logic techniques, and the efficacy of bacteriophage therapy in the treatment of bacterial infections of the upper respiratory tract in pediatric practice was determined. Taking this into consideration, we believe that research in this area should be extended.

Keywords: Bacteriophage, bacterial infection, respiratory tract, children

