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The detection rate of Chlamydia infection in schoolchildren

Abstract. Article represents the results of the test for 708 children in early and senior school ages for presence of Chlamydia contamination of mucosa of upper respiratory tract. Chlamydia verification was carried out by direct immune fluorescence technique. We show identified Chlamydia types structure in terms of age and gender. We show comparative evaluation of ENT-morbidity in children with and without recognized Chlamydia infection.

Keywords: Chlamydia infection, respiratory tract, schoolchildren.

Introduction

Respiratory diseases in children are serious pediatric concern and due to their wide prevalence they also are the concern of public health system as a whole. Despite every pediatrician has good respiratory awareness, at present there are plenty of unresolved problems related to comprehension of etiology and pathogenesis of separate forms of the diseases and their diagnosis. During the last two decades etiological spectrum of agents of the diseases in respiratory tract grew rapidly. Owing to the discovery of pathogenic microorganisms not known before and also to the implementation into medical practices several new efficient laboratory techniques aimed at diagnostics, such intracellular agents as Mycoplasms and Chlamydia are diagnosed in inflammation pathology in nose and pharynx more often than previously. Target researches for morphologic, biochemical and antigen characteristics allowed define the association of these infections with the occurrence of inflammation pathology of respiratory tract, which significantly enlarged the concept of epidemiology and etiopathogenesis of these diseases. The results were shown in Science and Practice Program, worked out by The Union of Pediatricians of Russia and International Foundation for Mother & Child Health (Year 2002), which states, that Chlamydia is critical respiratory agent.

Social economic and medical meaning of Chlamydia infection is caused by its significant influence on population reproduction. A number of urogenital Chlamydiosis researchers diagnosed the agent in 11-40% of pregnancies [10]. Risk of infection transmission to a fetus is 40-92% [3, 4]. As a result over 7% of newborns are Chlamydia contaminated at birth [2, 7]. At the same time 40% have conjunctivitis, 15–20% - nasopharyngitis, 10-20% - bronchitis and pneumonia, 5% -

gastroenteritis and proctitis, 15% - vulvitis and urethritis, in 6% septic character of the process was found [5].

In children Chlamydia are recognized as acute respiratory disease agent in 18% cases, obstructive laryngotracheitis in 15% cases [9]. Other research, which included DNA- diagnostics and immunoenzyme analysis, show Chlamydia etiology in acute bronchitis children in 13-25% cases and in pneumonia in 10-32% [1, 6, 11]. Provided that 80% pneumonia children associated with Chlamydia infection were in their pre-school and early school ages [6].

Until now, the Russian Federation, there is no information on to the frequency detection of chlamydia in the mucosa of the upper respiratory tract in children, with the exception of research conducted by the staff of state of the Federal State Institution "Scientific-Research Institute of medical problems of the North", SB RAMS which related to preschoolers. According to these studies in children attending day care, chlamydia were reported in 24.8% of individuals [12].

Results of wide scale seroepidemiological survey, held in the USA, Sweden, Finland and Congo marked anti Chlamydia antibodies in 30-69% children [13, 14, 15]. But positive results of serologic tests do not reflect actual level of Chlamydia contamination in children. They only point to the present or past contact with this infection.

Up to the present time in Russian Federation there is no information on frequency of revealing Chlamydia in the upper respiratory tract mucous membrane in children, except the research carried out by scientific workers of SFBI SRI MPN SD RAMS, which involved pre-school children. The research showed Chlamydia in children, attending kindergartens in 24.8%.

So, at present Chlamydia infection plays an important role in initiating the upper respiratory tract diseases in children population. Children, who attend educational institutions belong to risk group in terms of possible contamination because they closely contact Chlamydia infected children and adults. That is why taking into account high frequency of Chlamydia infection verification in pre-school children, the aim of the present research is to reveal the frequency of Chlamydia diagnosed in the upper respiratory tract in children of school ages, attending schools.

Materials and Methods of the Research.

Aimed at studying the frequency of Chlamydia infection we examined 708 schoolchildren by cross-sectional method. Among them there were 491 early school (in ages from 7 to 11 years) and 217 senior school (in ages from 12 to 15) children. By the presence/ absence of Chlamydia the children were divided into groups, comparable by gender and age.

For achieving the aim of the research we used overall data of examining children in different ages. The formation of separate selections picked up by random was based on the lists of school forms with the response of 84.1% to 89.5%. Total number of examined children was determined by

V.I. Paniotto [8].

Chlamydia infection was diagnosed by direct immunofluorescence (DIF). We had identified two types of Chlamydia: *Chlamydia trachomatis* and *Chlamydophila pneumoniae*. DIF was carried out with test-systems "ChlamySlide" (OOO "Galart" – Diagnostikum) with fluorochrome marked by monoclonal Chlamydia antibodies against main protein of outer membrane of *Chlamydia trachomatis* and *Chlamydophila pneumoniae*. Materials for Chlamydia antigen verification were mucous membrane smears scraped from upper sector of posterial pharyngeal and nose walls.

It should be marked that one of the most important points in Chlamydia infection diagnosis is material sampling and preparation of specimen for further tests. Taking into account that Chlamydia, *Chlamydia trachomatis* in particular provides high affinity to cylinder epithelium, we performed smear scraping of mucous membrane, covered by cylinder ciliate multinucleated epithelium, located in the floor of nasal cavity and side wall of nose up to lower border of middle nasal concha and also in pharynx upper sector (in naso-pharynx).

Sampling of clinical materials was carried out in the morning in the fasted state by sterile disposable probe with cotton ball. The probe was pressed to the surface and moved with slight scraping. In cases of mucous membrane excess or purulent discharge the surface was cleaned with another cotton ball. Obligatory conditions, which determined quality of samples was the presence of whole epithelial cells and absence of blood in smear. The material was applied to the surface of cavity of degreased slide, dried in the air and delivered to laboratory.

For describing binaural signs we calculated their relative frequencies and 95% confidence interval (95% CI). Evaluation of distinction significance of relative indices was carried out by Student's t-criterion and Fisher's exact criterion. We regarded the value of statistical meaning level equal or over 0.05 as maximum acceptable error rate of 1 kind (p).

Results and discussions

We had found Chlamydia structures in smears, scraped from pharynx mucous membrane in children, attending school in 87 cases out of 708, which made 12.3%. The highest percentage of contamination with Chlamydia agent was registered in junior schoolchildren in 14.7% (in 72 out of 491 children). The frequency of Chlamydia in junior schoolchildren exceeded the same index in senior schoolchildren more than two times ($p<0.001$). Verified Chlamydia were marked in senior children in 6.9% cases (in 15 out of 217 children), provided that we identified in 22 cases (in 3.1%) both Chlamydia types: *Chlamydophila pneumoniae* and *Chlamydia trachomatis* in both age groups (Table 1).

Chlamydophila pneumoniae was revealed more frequently, in 73 children (in 10.3%). *Chlamydia trachomatis* was verified two times less often than *Chlamydophila pneumoniae*

(p<0.001) and it was identified in 36 children (in 5.0%). In junior schoolchildren *Chlamydophila pneumoniae* (p<0.001) was revealed more often, in 12.8% cases. The frequency of *Chlamydia trachomatis* in this group was 6.1%. Whereas in senior schoolchildren *Chlamydophila pneumoniae* and *Chlamydia trachomatis* were revealed with equal frequency (p=0.3) in 4.6% and in 2.8% correspondingly. Chlamydia mixed contamination in junior schoolchildren was marked more often (p<0.001) in 4.3% cases and in senior schoolchildren in 0.5% cases being revealed in one child.

We did not mark statistically significant gender distinctions in Chlamydia contamination of the upper respiratory tract (p>0.05). Gender/ age frequency of Chlamydia in children, attending school is shown in Table 2.

So, among all the examined children Chlamydia agent was revealed with equal frequency in boys (in 12.9%), and in girls (in 11.6 %). We also did not find the proof of gender distinctions between different types of Chlamydia: *Chlamydophila pneumoniae* in 10.2% in girls and in 10.4% in boys, *Chlamydia trachomatis* in 3.8% and 6.3% correspondingly (p=0.1).

Our research does not find significant differences in frequency of revealing Chlamydia agent in boys and girls in terms of age. In boys and girls of junior school ages Chlamydia was verified in 15.0% and in 14.3% correspondingly (p=0.8). In children of senior school ages Chlamydia infection was identified in 8.5% in boys and in 5.1% in girls (p=0.3).

The analysis of frequency of revealing othorhinolaryngological pathology in children, contaminated and non-contaminated with Chlamydia showed that acute diseases were determined more frequently in Chlamydia contaminated junior schoolchildren (43.1% against 15.3% correspondingly, p<0.001). They also showed significantly higher overall index of frequency of revealed ENT-organs diseases (p<0.001). Besides, we revealed considerably less number of healthy children among contaminated subjects as compared to group without verified Chlamydia (in 23.6% against 59.2%, p<0.001). Chronic pathology was marked with the same frequency in both presence/ absence of Chlamydia infection (in 33.3% against 25.5% correspondingly, p=0.2).

Higher total frequency of acute diseases in confirmed Chlamydia infection referred to the presence of large number of acute rhinopharyngitis, which was diagnosed in 36% against 12% children without Chlamydia (p<0.001).

We did not mark statistically meaningful distinctions in regard to acute rhinitis occurrence between groups of junior schoolchildren (p=0.2). Acute rhinitis was diagnosed in 7 % in subjects with verified Chlamydia and in 3.3% in children without Chlamydia.

Over half of junior schoolchildren in 59% (in 248 cases) without confirmed Chlamydia infection did not show any obvious ENT –pathology. At the same time in group with marked

Chlamydia only in 23.6% ear, throat and nose diseases were not revealed (17 children). Differences between these indices turned out to be statistically meaningful ($p<0.001$).

We also marked the differences when analyzing the frequency of ENT-pathology occurrence in senior schoolchildren. So, we diagnosed less often ($p<0.001$) different ENT-organ diseases in subjects without verified Chlamydia antigen in mucous membrane of the upper respiratory tract. We had found them in 27.7% cases in comparison with 86.7% cases among children with verified Chlamydia.

High ENT-morbidity in senior schoolchildren with identified Chlamydia as compared with subjects without Chlamydia contamination was determined by higher frequency of acute diseases in common (in 53.3% against 6.9% correspondingly, $p<0.001$). Chronic diseases of the upper respiratory tract were practically equally diagnosed in senior schoolchildren without association with Chlamydia presence or absence, in 33.3% and 20.8% correspondingly ($p=0.3$).

Higher total frequency of acute diseases in children with confirmed Chlamydia infection was caused by the presence of both acute rhinopharyngitis ($p<0.001$), and acute rhinitis ($p=0.04$) in majority of children. Acute rhinopharyngitis in groups in children with and without Chlamydia was found in 40% (in 6 subjects) and in 6 % (in 12 subjects) cases. Acute rhinitis was revealed less often and was diagnosed only in 2 children of each group, in 3.3% and in 1% correspondingly.

In senior schoolchildren without Chlamydia contamination there were significantly more subjects ($p<0.001$), without any ENT-disease, 146 children (72.3%). In group of Chlamydia infected children the absence of ENT pathology was marked only in 2 children (13%).

There were no differences in separate nosologic forms of chronic ENT-pathology frequency in all the age groups.

Conclusions

1 We found Chlamydia contamination of mucous membrane of the upper respiratory tract in 12.3% schoolchildren. The frequency of revealing Chlamydia is decreased with the age and approaches 15% in junior schoolchildren and 7% in senior. In type structure of identified Chlamydia Chlamydophila pneumoniae dominated in schoolchildren.

2 Our research did not confirm differences in terms of gender in the frequency of Chlamydia revealing and contamination with definite types of agent.

3 The presence of Chlamydia in pharynx mucous membrane in junior and senior schoolchildren determines the tendency to incidence of ENT acute inflammatory diseases (in 43.1% and 53.3% cases correspondingly in children with Chlamydia against 15.3% and 6.9% children without Chlamydia).

4 In children with verified Chlamydia agent of both junior and senior groups the total level of ENT-pathology was higher than in children without diagnosed Chlamydia infection. So, in junior schoolchildren this index was 76.4% against 40.8%, and in senior 86.7% against 27.7%.

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Table 1

Prevalence of Chlamydia different types in schoolchildren

Age group and its volume	*Chlamydophila pneumoniae* (cases)		*Chlamydia trachomatis* (cases)		Chlamydia mixed-infection (cases)		Totally revealed Chlamydia children	
	n	% 95% CI	*n*	% 95% CI	*n*	% 95% CI	n	% 95% CI
Group 1: 7-11 years of age n=491	63	12.8 10.0-15.9 $p_{2-3}<0.001$	30	6.1 4.2-8.4 $p_{2-3}=0.04$	21	4.3 2.7-6.2 $p_{2-3}<0.001$	72	14.7 11.7-17.9 $p_{2-3}<0.001$
Group 2: 12-15 years of age n=217	10	4.6 2.2-7.8	6	2.8 1.0-5.4	1	0.5 0.0-1.8	15	6.9 3.9-10.7
TOTALLY (n=708)	73	10.3 8.2-12.7	36	5.0 3.6-6.8	22	3.1 2.0-4.5	87	12.3 10.0-14.8

Note: *p* – statistical significance of distinctions between groups of children of different age

Table 2

Frequency of Chlamydia in accordance with gender and age in children, attending school (n=708)

Gender	*Chlamydophila pneumoniae* (cases)		*Chlamydia trachomatis* (cases)		Chlamydia mixed-infection (cases)		Totally revealed Chlamydia children	
	n	%	n	%	n	%	n	%
7-11 years of age (n=491. out of them: m – 246; f - 245)								
male	31	12.6	19	7.7	13	5.3	37	15.0
female	32	13.1	11	4.5	8	3.3	35	14.3

12-15 years of age (n=217. out of them: m – 118; f - 99)								
male	7	5.9	4	3.4	1	0.9	10	8.5
female	3	3.0	2	2.0	0	0	5	5.1
Common group of children (n=708. out of them: m – 364; f - 344)								
male	38	10.4	23	6.3	14	3.8	47	12.9
female	35	10.2	13	3.8	8	2.3	40	11.6

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