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Original scientific paper

Respiratory Infections in Children Hospitalized at the University Hospital Mostar during War and Post-War Period

Dženis Jelčić[1], Marija Grle[2] and Tomislav Strinić[3]

[1] Unit for Gynecology and Obstetrics, Health Center Metković, Metković, Croatia
[2] Department for Pediatrics, University Hospital Mostar, Mostar, Bosnia and Herzegovina
[3] Department for Gynecology and Obstetrics, University Hospital Center Split, Split, Croatia

A B S T R A C T

Our aim was to investigate the incidence of respiratory infections in children treated at the Pediatric Department of the University Hospital Mostar during war (1993 and 1994) and after the war (2003 and 2004). In order to collect data we used medical histories of children with respiratory infections. Incidence of respiratory infections in children in war period was 230/1000, while in post-war period it was 190/1000. There was no significant difference in the incidence of respiratory infections in children during war and after the war (p=0.051). We have not found increase in respiratory infections prevalence in children treated during war period at the Pediatric department of University Hospital Mostar, compared to the period after the war. However, we did report certain differences related to age, clinical parameters, seasonal pattern, diagnosis, therapy and mean hospitalization time.

Key words: *respiratory infections, children, incidence, war, Bosnia and Herzegovina*

Introduction

Patients with acute respiratory infections, especially those with infections of upper respiratory tract, are the most common visitors of pediatric departments and other primary health care practices. They are the reason for frequent antibiotic prescription and the main reason for missing from school[1,2]. The children are more sensitive to respiratory infects than adults. The reason for this could be the first contact and inefficient specific immunization to microbes in early childhood[3]. The most common respiratory microbes are viruses, Mycoplasma and bacteria. The viruses are the main cause for more then 85% of all acute respiratory infections[4]. Clinically, these infections appear within whole spectrum of symptoms and different stages of illness. Respiratory infections can be divided into infections of upper and lower respiratory tract. The infections are usually mild catharal infections of upper respiratory tract caused by viruses and their complications as bacterial superinfections (sinusitis, otitis). Upper respiratory infections are angina and croup syndrome, and they appear in several well-defined diseases which include laryngeal diphtheria, acute catarrhal and spastic laryngitis and malignant obstructive laryngotracheobronchitis. Acute respiratory infections of lower respiratory tract are acute bronchitis, bronchiolitis and pneumonia[5]. Pneumonia is the most difficult infection of the respiratory tract and requests special treatment, although it is involved in only 1% of all acute respiratory infections[5]. 95% of all pneumonias in small children in world appear in developing countries, such as Bosnia and Herzegovina. Etiological diagnosis of respiratory infections is rarely established in developing countries, therefore World Health Organization (WHO) recommends primary healthcare physicians to make a diagnose on the basis of clinical parameters. WHO suggests appropriate treatment of respiratory infections which will develop health care and decrease the mortality[6].

The awareness of rational antibiotics prescription often lacks in reference to acute infections of the upper respiratory tract, which then leads to unnecessary use of antibiotics in treatment of viral respiratory infections[7,8]. 70% of all *per* oral antimicrobial drugs are used for treat-

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ment of acute respiratory infections[4]. Researches prove that the number of prescribed antibiotics annually increases with age and with years of physicians work experience[7,9]. Irrational prescribing of antibiotics cause resistance of pathogenic microorganisms which may cause epidemics or even pandemic measures in future, and today it is already a significant problem in the world[7,10]. Inflammatory mediators that are involved in acute respiratory infections during the development of the respiratory tract can leave long-term consequences on pulmonary functions[5,11,12]. In the world, acute respiratory infections are the leading cause of mortality in children younger than 5 years old[5]. Most of these deaths are caused by pneumonia and bronchiolitis[5,13]. Stated facts imply that prevention of these infections in children is extremely important. Hygiene dietetic regime (hand washing and appropriate food) and separating sick children from healthy, if possible, lays the foundation of prevention of acute respiratory infections[3,14]. The aim of this study was to show prevalence of acute respiratory infections in children treated at the University Hospital Mostar.

Materials and Methods

This cross-sectional study was performed at the Clinic for Pediatrics, University Hospital Mostar during two periods: during the war (1993 and 1994) and after the war (2003 and 2004). In war period the number of hospitalized children was 1107 and 273 children with acute respiratory infections were included in the study. In after the war period the number of hospitalized children was 2774 and 527 had respiratory infections and were included in the study. The data were obtained from medical histories of the children treated at the Department of Pediatrics, University Hospital Mostar. The used parameters were age, gender, blood examination (sedimentation of erythrocytes and leukocytes), body temperature, annual seasons and mean hospitalization time. In data evaluation C-reactive protein was excluded because it was not used during the war period. The data have been processed using the program SPSS 10.0 for Windows and interpreted with descriptive statistics. For statistical analyses we used χ^2-test and F-test. The statistical significance for all tests was $p<0.05$.

Results

In this study it has been proven that there is no statistically significant difference in incidence of respiratory infections in children during war and after the war (Table 1). Number of upper respiratory infections *per* 1000 hospitalized children decreased in post-war period but the number of lower respiratory infections did not change (Table 1).

Considering the age, children were divided in four groups: newborns (0–28 days), infants (1–12 months), little children (2–6 years) and school children (7–19 years). Number of newborns statistically decreased and number of little children with respiratory infections increased in post-war period (Table 2).

There was no statistically significant gender difference in incidence of respiratory infections in children in these two periods (Table 3). The number of children with positive laboratory parameters (SE≥11 mm/h, $L\geq10\times10^9$/L) increased in post-war period, while the number of febrile children (Tax≥38 °C) with respiratory infection remained the same two other periods (Table 4). Considering seasons, the number of children with respiratory infections has increased in winter and fall in period after the war (Table 5).

The number of children with the diagnosis of angina, acute pharyngitis and acute bronchitis decreased, and those with diagnose of croup syndrome, bronchopneumonia and pleuropneumonia increased in period after war (Table 6). The number of children with respiratory infections treated with penicillins, cephalosporins and symptomatologic therapy increased in period after the war (Table 7). Mean hospitalization time increased in children with diagnose of acute rhinosinusitis, acute rhinopharyngitis and bronhopneumonia in period after the war (Table 8).

Discussion and Conclusion

Because of specific socioeconomic conditions increased incidence of respiratory infections in children was expected during the war. People of Mostar were fighting for existence and living conditions were minimal[15]. Provision of adequate shelter, food, water and sanitation was

TABLE 1
INCIDENCE OF RESPIRATORY INFECTIONS DURING WAR AND PERIOD AFTER THE WAR IN CHILDREN HOSPITALIZED AT THE CLINIC FOR PEDIATRICS OF THE UNIVERSITY HOSPITAL MOSTAR

Period	Children with respiratory infections (N)			Hospitalized children (N)	Children with respiratory infections N/1000 hospitalized		
	URT	LRT	A		URT	LRT	A
War	155	118	273	1187	131	99	230
After the war	220	307	527	2774	79*	111†	190‡

URT – upper respiratory tract; LRT – lower respiratory tract; A – all children with respiratory infections
* $\chi^2=12.88$; $p<0.001$
† $\chi^2=0.69$; $p=0.408$
‡ $\chi^2=3.81$; $p=0.051$

TABLE 2
DISTRIBUTION OF CHILDREN WITH RESPIRATORY INFECTIONS IN AGE GROUPS

Age group	Children in periods	
	W N (%)	AW N (%)
Newborns (0–28 days)	29 (10.6)	22 (4.2) *
Infants (1–12 months)	63 (23.1)	102 (19.4)
Little children (2–6 years)	133 (48.7)	310 (58.8)†
School children (7–19 years)	48 (17.6)	93 (17.6)
All	273 (100)	527 (100)

W – war period; AW – period after the war
*χ^2=12.53; p<0.001.
† χ^2=7.43; p=0.006

TABLE 3
DISTRIBUTION OF CHILDREN WITH RESPIRATORY INFECTIONS ACCORDING TO GENDER

Gender	Children in periods	
	W N (%)	AW N (%)
Male	159 (58.2)	309 (58.6)
Female	114 (41.8)	218 (41.4)
All*	273 (100)	527 (100)

W – war period; AW – period after the war
*χ^2=0.01; p=0.915

impossible. Other possible reasons for expecting increase in incidence of respiratory infections in children in the war are stress, overcrowding and malnutrition[6,14,16,18]. Results of this research show that there was no statistically significant difference in incidence of respiratory infections of children during the war and after war period. These results are not in correlation with similar researches in world that show increased incidence of respiratory infections in children in war conditions[17,18]. The number of newborns in post-war period decreased. Incidence of respiratory infections in little children increased in period after the war, and incidence in other age groups did not change. Respiratory infections were most frequent in little children which correlates with similar researches in Senegal, Asia and Latin America[19–21]. No statistically significant difference was found between children in two periods in relation to gender, although respiratory infections were more frequent in boys which correlates with world data[22]. In both periods respiratory infections in children were most frequent in winter which correlates with studies performed in Canada, North America and Russia[23–25]. In this study it was found that number of children with acute tonsillopharyngitis, acute pharyngitis and acute bronchitis has decreased in the period after the war. Most probable reason was better organization and availability of primary health care, so that the children with this diagnosis were treated in primary health care. Incidence of children with diagnosis croup syndrome, bronchopneumonia and pleuropneumonia reached statistically significant increase in period after the war. We assume that the reason for this is better as well as available health care and diagnostic procedure. Fewer number of children was treated with penicillins during period after the war. Because of resistance, physicians all over the world prescribe new generations of antibiotics, for example cephalosporins. Maybe, this is the reason why incidence of children treated with cephalosporins in-

TABLE 5
DISTRIBUTION OF CHILDREN WITH RESPIRATORY INFECTIONS ACCORDING TO SEASONS

Season	Children in periods	
	W N (%)	AW N (%)
Spring	66 (24.2)	136 (25.8)
Summer	53 (19.4)	98 (18.6)
Fall	90 (33)	120 (22.8) *
Winter	64 (23.4)	173 (32.8) †
All	273 (100)	527 (100)

W – war period; AW – period after the war
* χ^2=7.60; p=0.005.
†χ^2=9.66; p=0.019

TABLE 4
LABORATORY PARAMETERS IN CHILDREN WITH RESPIRATORY INFECTIONS

Period	Number (%) used clinical parameters						
	S			L		T	
	<11mm/h	≥11mm/h	Did not measure	<10×10⁹/L	≥10×10⁹/L	<38 °C	≥38 °C
War	25 (9.2)	221 (81.0)*	27 (9.9)	63 (23.1)	210 (76.9)†	123 (45.1)	150 (54.9)‡
After war	86 (16.3)	398 (75.5)*	43 (8.2)	259 (49.1)	268 (50.9)†	203 (38.5)	324 (61.5)‡
All	111 (13.9)	619 (77.4)	70 (8.8)	322 (40.3)	478 (59.8)	326 (40.8)	474 (59.3)

S – sedimentation of erythrocytes; L – leukocytes; T – body temperature
*χ^2=7.32; p=0.006
†χ^2=50.82; p<0.001
‡ χ^2=3.18; p=0.074

TABLE 6
DISTRIBUTION OF CHILDREN WITH RESPIRATORY INFECTIONS ACCORDING TO DIAGNOSIS

Diagnosis	Children in periods	
	W N (%)	AW N (%)
Acute rhinosinusitis and acute rhinopharyngitis	58 (21.2)	97 (18.4)
Acute sinusitis	4 (1.5)	17 (3.2)
Acute tonsillopharyngitis (angina) and acute pharyngitis	91 (33.3)	85 (16.1)*
Croup syndrome	2 (0.7)	21 (4.0)†
Acute bronchitis	32 (11.7)	26 (4.9)‡
Acute bronchiolitis	2 (0.7)	12 (2.3)
Bronchopneumonia	72 (26.4)	224 (42.5)§
Pneumonia	12 (4.4)	12 (2.3)
Pleuropneumonia	0	33 (6.3)‖
All	273 (100)	527 (100)

W – war period; AW – period after the war
* χ^2=31.02; p<0.001
† χ^2=15.70; p<0.001
‡ χ^2=12.32; p<0.001
§ χ^2=20.076; p<0.001
‖ χ^2=17.830; p<0.001

creased in period after the war. Awareness among doctors about the judicious use of antibiotics and patient education all over the world will reduce inappropriate use of antibiotics. Incidence of children treated only with symptomatic therapy increased in period after the war, therefore we can say that the Clinic for Pediatrics of the University Hospital Mostar is improving the trend of rational antibiotic prescribing. Mean hospitalization time of children with diagnosis of acute rhinosinusitis, rhinopharyngitis and bronchopneumonia decreased in the post-war period. These results are opposite to those from study performed in Guinea where mean hospitalization time was shorter during armed conflict[18]. Mean hospitalization time of children with respiratory infections is longer in war and after the war period than in the world. Mean hospitalization time for children with pneumonia in war period was 15.0±4.9 days, in period after the war 11.7±4.7 days and in the world 3[26] to 5 days[27]. Mean hospitalization time for children with infections of lower respiratory tract was 9.3±3.7 to 15.0±4.9 days, while in similar study performed in Dallas, Texas, mean hospitalization time for children with infections of lower respiratory tract was 5 days[27]. The most important conclusion of this study is that there was no statistically significant difference in incidence of respiratory infections in children during war and period after the war.

TABLE 7
DISTRIBUTION OF CHILDREN WITH RESPIRATORY INFECTIONS ACCORDING TO THERAPY

Therapy	Children in periods	
	W N (%)	AW N (%)
Penicillins	202 (74.0)	320 (60.7)*
Cephalosporins	15 (5.5)	72 (13.7)†
Aminoglycosides	9 (3.3)	5 (0.9)
Macrolides and lincosamides	21 (7.7)	29 (5.5)
Sulfonamides and trimethoprim	13 (4.8)	10 (1.9)
Symptomatic therapy	13 (4.8)	91 (17.3)‡
All	273 (100)	527 (100)

W – war period; AW – period after the war
* χ^2=13.97; p<0.001
† χ^2=37.35; p<0.001
‡ χ^2=58.50; p<0.001

TABLE 8
COMPARISON OF HOSPITALISATION MEAN TIME OF CHILDREN HOSPITALIZED WITH RESPIRATORY INFECTIONS

Diagnosis	$\overline{X}$±SD	
	W	AW
Acute rhinosinusitis and acute rhinopharyngitis	8.4±3.8	6.5±3.4*
Acute sinusitis	11.5±6.2	8.6±4.4
Angina and acute pharyngitis	9.1±3.6	8.8±3.6
Croup syndrome	4.5±4.5	5.0±3.9
Acute bronchitis	9.3±3.7	9.9±4.5
Acute bronchiolitis	12.5±4.9	10.0±4.1
Bronchopneumonia	13.4±4.8	10.2±3.5†
Pneumonia	15.0±4.9	11.7±4.7
Pleuritis ‖	–	13.8±6.0

W – war period; AW – period after the war
* F=10.59; p=0.001
† F=35.95; p<0.001

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Dž. Jelčić

Medical Center Metković, Ante Starčevića 12, Metković, Croatia
e-mail: dzenis_jelcic@net.hr

RESPIRATORNE INFEKCIJE U DJECE LIJEČENE U SVEUČILIŠNOJ BOLNICI MOSTAR TIJEKOM RATA I POSLIJERATNOG RAZDOBLJA

SAŽETAK

Cilj ove studije je bio istražiti zastupljenost respiratornih infekcija u djece liječene na Odjelu za dječje bolesti KB Mostar tijekom rata (1993. i 1994. godina) i poslijeratnog razdoblja (2003. i 2004. godina). Obuhvaćene su dvije skupine djece s respiratornim infekcijama liječene na Odjelu za dječje bolesti KB Mostar u razdoblju 1993. i 1994. godine te 2003. i 2004. godine. U cilju skupljanja podataka korištene su povijesti bolesti djece s respiratornim infekcijama liječene na Odjelu za dječje bolesti KB Mostar. Učestalost respiratornih infekcija u djece u ratnom razdoblju je 230/1000, a u poslijeratnom razdoblju 190/1000 hospitaliziranih. Pokazalo se da nema statistički značajne razlike između navedenih skupina odnosno da nema značajnog smanjenja broja bolesnika u poslijeratnom razdoblju (χ^2=3,810; p=0,051). Tijekom ratnog razdoblja nismo našli veću zastupljenost respiratornih infekcija u djece liječene na Odjelu za dječje bolesti KB Mostar u odnosu na poslijeratno razdoblje. Uspoređujući promatrana razdoblja utvrdili smo određene razlike u djece s respiratornim infekcijama s obzirom na dob, kliničke parametre, godišnja doba, dijagnozu, liječenje i duljinu boravka u bolnici.