

doi: 10.13241/j.cnki.pmb.2017.13.038

儿科住院患儿下呼吸道感染的病原菌分布及耐药性分析*

倪莎莎¹ 陈蓓蓓¹ 马依晨¹ 李艳¹ 柳文婧¹ 李鸿馨² 张进军³

(1 陕西省宝鸡市中心医院儿科 陕西 宝鸡 721008; 2 首都儿科研究所 北京 100000;

3 陕西省西安市儿童医院 陕西 西安 710000)

摘要 目的:分析我院儿科患儿医院下呼吸道感染的病原菌分布情况和耐药性情况,为临床合理使用抗菌药物提供依据。**方法:**本文以我院儿科近年来(2015年8月至2016年8月期间)临床收治的下呼吸道感染患儿566例为研究对象,针对患儿的病原菌分布情况和耐药性情况进行了调查研究。**结果:**本次研究的566例患儿共检出病原菌126株,病原菌检出率为22.26%。其中肺炎克雷伯菌、大肠埃希氏菌、金黄色葡萄球菌和表皮葡萄球菌,构成比分别为23.80%、17.56%、10.32%和7.14%;肺炎克雷伯菌对氨苄西林、头孢曲松、复方新诺明、氯曲南的耐药率分别为76.67%、73.33%、36.67%和26.67%;大肠埃希氏菌对氨苄西林、复方新诺明、头孢曲松、哌拉西林、头孢吡肟、头孢他啶的耐药率分别为72.73%、72.73%、68.18%、45.46%、27.27%、22.72%;金黄色葡萄球菌对氨苄西林、红霉素、阿奇霉素、克林霉素、复方新诺明、庆大霉素的耐药率分别为100.00%、84.6%、84.6%、69.23%、53.85%和38.46%。**结论:**儿科医院呼吸道感染的病原菌以肺炎克雷伯菌、大肠埃希氏菌和金黄色葡萄球菌为主,且多重耐药菌感染增多,临床抗菌药选择的应根据药敏试验结果进行针对性的选择用药以提高临床治疗的有效性及其合理性,减少耐药菌株产生。

关键词:儿科住院患儿;呼吸道感染;病原菌分布;耐药性

中图分类号:R722;R725.6 **文献标识码:**A **文章编号:**1673-6273(2017)13-2546-04

Study on the Distribution and Drug Resistance Status of the Pathogen of Lower Respiratory Infections in Hospitalized Children*

NI Sha-sha¹, CHEN Bei-bei¹, MA Yi-chen¹, LI Yan¹, LIU Wen-jing¹, LI Hong-xin², ZHANG Jin-jun³

(1 Department of Pediatrics, Baoji Central Hospital, Baoji, Shaanxi, 721008, China;

2 Capital Institute of Pediatrics, Beijing, 100000, China; 3 Xi'an Children's Hospital, Xi'an, Shaanxi, 710000)

ABSTRACT Objective: To fully understand and master the distribution and drug resistance status of the pathogen of lower respiratory infection in hospitalized children in Department of Pediatrics in our hospital, so as to provide basis for appropriate prescription of anti-biotic drugs clinically. **Methods:** 566 cases of respiratory tract infection in Department of Pediatrics in our hospital in recent years (from August 2015 to August 2016) were chosen as the research objects. The distribution of children against pathogens and drug resistance were investigated. **Results:** 126 pathogens were found in the 566 cases, and pathogen detection rate was 22.26%. The constituent ratio of *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Escherichia coli*, *Staphylococcus aureus*, and *Staphylococcus epidermidis* was 23.80%, 17.56%, 10.32% and 7.14%, respectively. The drug resistance rate of *Klebsiella pneumoniae* to ampicillin, cephalosporin ceftriaxone, complex force sulfamethoxazole and aztreonam was 76.67%, 73.33%, 36.67% and 26.67%, respectively. The drug resistance rate of *Escherichia coli* to ampicillin, complex force new sulfamethoxazole, cephalosporin ceftriaxone, piperacillin, cefepime and ceftazidime was 72.73%, 72.73%, 68.18%, 45.46%, 27.27% and 22.72%, respectively. The drug resistance rate of *Staphylococcus aureus* to ampicillin, erythromycin, azithromycin, clindamycin, complex force sulfamethoxazole and gentamicin was 100.00%, 84.6%, 84.6%, 69.23%, 53.85% and 38.46%, respectively. **Conclusion:** The pathogens in respiratory infection in hospitalized children mainly consist of *Klebsiella pneumoniae*, *Escherichia coli* and *Staphylococcus aureus*, with increased multiple drug resistant bacteria. The clinical antibiotic selection should be based on drug susceptibility test results in order to improve the clinical effectiveness and rationality of treatment, and to reduce the occurrence of resistant bacteria.

Key words: Hospitalized children in pediatrics; Respiratory tract infection; Pathogen distribution; Drug resistance

Chinese Library Classification(CLC): R722; R725.6 **Document code:** A

Article ID: 1673-6273(2017)13-2546-04

前言

临床报道发现^[1-3],儿童呼吸道感染疾病属于临床最为常见的儿科疾病类型之一,患儿人群规模正呈现出逐年升高的

* 基金项目:陕西省宝鸡市卫生局科研立项(2012-16号)

作者简介:倪莎莎(1981-),主治医师,研究方向:临床儿科,E-mail:32190716@qq.com

(收稿日期:2016-12-08 接受日期:2016-12-29)

趋势。受环境、地区、气候以及患儿个体差异等因素的影响,导致患儿的医院呼吸道感染的病原菌分布情况特点也不尽相同^[4,5]。在抗生素广泛应用于临床治疗的背景下,相关导致患儿呼吸道感染致病菌的耐药水平也不断升高,不仅仅给临床治疗增加了难度,同时也增加患儿家长的经济负担^[6,7]。在此背景下,本次研究为了全面了解和掌握我院儿科患儿医院呼吸道感染的病原菌分布情况和耐药性情况,以便为患儿医院呼吸道感染的临床预防工作提供借鉴和参考依据。本文以我院儿科近年来(2015年8月至2016年8月期间)临床收治的呼吸道感染患儿566例为研究对象,针对患儿的病原菌分布情况和耐药性情况进行了如下的调查研究和报道:

1 资料与方法

1.1 临床资料

本次研究选取我院儿科2015年8月至2016年8月期间临床收治的呼吸道感染患儿566例为研究对象进行研究和比较分析。566例患儿的临床资料为:(1)性别分布:男性366例,女性200例;(2)年龄分布:0-6岁,平均年龄(3.22±0.34)岁,3岁以上(含3岁)的患者311例,3岁以下的患者255例。

1.2 病原菌检测

全部患儿均采用一次性无菌痰液收集器采集其痰分泌物样本,并严格按照《全国临床检验操作规程》中的相关要求和具体操作步骤进行样本的培养和菌株的鉴定^[8,9]。

1.3 药敏试验

均采用ATB Expression系统对相关菌株的药敏情况进行试验,并准确记录试验结果。

1.4 观察指标

对本次研究全部患儿医院呼吸道感染的病原菌分布情况和耐药性情况进行调查研究。

1.5 统计学方法

本次研究过程中,针对相关资料的数据统计均采用SPSS19.1软件包进行数据处理和数据分析。本研究中的统计描述计量资料用 $\bar{x} \pm s$ 表示,计数资料用率或构成比表示。统计推断用计量资料用t检验,计数资料用 χ^2 检验。以 $P < 0.05$ 时,认为数据比较差异具有统计学意义。

2 结果

2.1 呼吸道感染的病原菌分布情况

本次研究的566例患儿共检出病原菌126株,病原菌检出率为22.26%。126株病原菌中,排名前4位的病原菌分别为肺炎克雷伯菌、大肠埃希氏菌、金黄色葡萄球菌和表皮葡萄球菌,构成比分别为23.80%、17.56%、10.32%和7.14%。见表1。

2.2 肺炎克雷伯菌对常用抗菌药物的耐药性情况

肺炎克雷伯菌对氨苄西林、头孢曲松、复方新诺明、氨基糖苷类的耐药率分别为76.67%、73.33%、36.67%和26.67%。见表2。

2.3 大肠埃希氏菌对常用抗菌药物的耐药性情况

大肠埃希氏菌对氨苄西林、复方新诺明、头孢曲松、哌拉西林、头孢吡肟、头孢他啶的耐药率分别为72.73%、72.73%、68.18%、45.46%、27.27%、22.72%。见表3。

2.4 金黄色葡萄球菌对常用抗菌药物的耐药性情况

金黄色葡萄球菌对氨苄西林、红霉素、阿奇霉素、克林霉素、复方新诺明、庆大霉素的耐药率分别为100.00%、84.6%、84.6%、69.23%、53.85%和38.46%。见表4。

表1 呼吸道感染的病原菌分布及构成比(%)

Table 1 Pathogen distribution and constituent ratio in respiratory tract infection (%)

Pathogen	Strain	Constituent ratio
<i>Klebsiella pneumoniae</i>	30	23.80
<i>Escherichia coli</i>	22	17.46
<i>Staphylococcus aureus</i>	13	10.32
<i>Staphylococcus epidermidis</i>	9	7.14
<i>Pseudomonas aeruginosa</i>	8	6.35
<i>Acinetobacter</i>	4	3.17
<i>Enterobacter cloacae</i>	3	2.38
Other	37	29.36

表2 肺炎克雷伯菌(n=30)对常用抗菌药物的耐药情况(%)

Table 2 Drug resistance of *Klebsiella pneumoniae* (n=30) to common antibiotics (%)

Common antibiotics	Strain	Drug resistance rate
Ampicillin	23	76.67
Head ceftriaxone	22	73.33
Sulphatrim	11	36.67
Aztreonam	8	26.67
Ciprofloxacin	6	20
Piperacillin	6	20
Minocycline	5	16.67
Gentamicin	5	16.67
Cefepime	3	10.00
Ceftazidime	3	10.00
Tazobactam	2	6.67
Amikacin	1	3.33
Tobramycin	1	3.33
Meropenem	0	0.00
Levofloxacin	0	0.00
Colistin	0	0.00
Ofloxacin	0	0.00
Chloramphenicol	0	0.00

3 讨论

临床统计调查显示^[10-13]:由于儿童的呼吸系统抵抗力差,并且免疫功能不健全,一旦受到细菌、病毒、衣原体、支原体以及真菌等病原体的侵袭,很容易发生呼吸道感染。因此,呼吸道感染已经成为了儿童常见疾病中患病率较高的疾病之一,其中最常见的是细菌导致的呼吸道感染。既往文献报道结果发现:在临床治疗呼吸道感染的过程中,往往存在一定的难度,这是由于病原菌本身具有多样性、季节性和地区性的特征,并且在病原菌分布的持续变化、抗性增强的趋势下,临床治疗的复制性也较多^[14]。

表 3 大肠埃希氏菌(n=22)对常用抗菌药物的耐药情况(%)

Table 3 Drug resistance of *Escherichia coli* (n=22) to common antibiotics (%)

Common antibiotics	Strain	Drug resistance rate
Ampicillin	16	72.73
Sulphatrim	16	72.73
Head ceftriaxone	15	68.18
Piperacillin	10	45.46
Ciprofloxacin	8	36.36
Gentamicin	8	36.36
Aztreonam	6	27.27
Cefepime	6	27.27
Ceftazidime	5	22.72
Minocycline	2	9.1
Amikacin	2	9.1
Levofloxacin	0	0.00
Ofloxacin	0	0.00
Chloramphenicol	0	0.00

表 4 金黄色葡萄球菌(n=13)对常用抗菌药物的耐药情况(%)

Table 4 Drug resistance of *Staphylococcus aureus* (n=13) to common antibiotics (%)

Common antibiotics	Strain	Drug resistance rate
Ampicillin	13	100.00
Erythromycin	11	84.6
Azithromycin	11	84.6
Clindamycin	9	69.23
Sulphatrim	7	53.85
Ampicillin / Sulbactam	7	53.85
Ofloxacin	6	46.15
Oxacillin	6	46.15
Ciprofloxacin	5	38.46
Gentamicin	5	38.46
Moxifloxacin	5	38.46
Rifampicin	2	15.38
Minocycline	2	15.38
Chloramphenicol	1	7.69
Doxycycline	0	0.00
Linezolid	0	0.00
Vancomycin	0	0.00

医学调查资料表明^[15,16]：呼吸道感染的主要致病菌是金黄色葡萄球菌和肺炎克雷伯菌。而上文研究的数据结果显示：本次研究的 566 例患儿共检出病原菌 126 株，病原菌检出率为 22.26%。126 株病原菌中，排名前 4 位的病原菌分别为肺炎克雷伯菌、大肠埃希氏菌、金黄色葡萄球菌和表皮葡萄球菌，构成比分别为 23.80%、17.56%、10.32%和 7.14%。这一数据结果与医学调查资料中的结果相符。

回顾临床关于耐药性的相关文献报道后，我们总结认为^[17-20]：对于耐药率已经较高的克林霉素、阿奇霉素、复方新诺明等药物已经不适合作为儿童呼吸道感染的治疗用药；万古霉素的杀菌力极强，是治疗金黄色葡萄球菌感染的特效药，但因其应

用指征非常严格，一般作为抗菌的最后措施，同时为避免筛选出更多耐药菌株，一般需要经过审批确认是由于金黄色葡萄球菌感染才使用，并且价格昂贵，因此使用率不高；而四环素类、氯霉素、利福平的临床敏感性较高，临床上可根据实际需要进行选择用药。

从上文的数据结果分析上看：肺炎克雷伯菌对氨苄西林、头孢曲松、复方新诺明、氨曲南的耐药率分别为 76.67%、73.33%、36.67%和 26.67%；大肠埃希氏菌对氨苄西林、复方新诺明、头孢曲松、哌拉西林、头孢吡肟、头孢他啶的耐药率分别为 72.73%、72.73%、68.18%、45.46%、27.27%、22.72%；金黄色葡萄球菌对氨苄西林、红霉素、阿奇霉素、克林霉素、复方新诺明、庆大霉素的耐药率分别为 100.00%、84.6%、84.6%、69.23%、53.85%和 38.46%。这一结果也符合文献中的报道。提示我们在临床抗菌药选择的过程中应参考上述耐药率情况进行针对性的选择。

因此，综合以上阐述，儿科患儿医院呼吸道感染的病原菌以肺炎克雷伯菌、大肠埃希氏菌和金黄色葡萄球菌为主，临床抗菌药选择的应根据药敏试验结果进行针对性的选择用药以提高临床治疗的有效性。

参 考 文 献(References)

- [1] 徐瑾, 陈群英. 某妇儿医院儿科重症监护室患者呼吸道感染病原菌及其耐药性监测[J]. 中国消毒学杂志, 2015, 32(2): 124-126
Xu Jin, Chen Qun-ying. Distribution and drug resistance of pathogens in PICU respiratory infection [J]. Chinese Journal of Disinfection, 2015, 32(2): 124-126
- [2] 陈伟伟, 雷励, 党惠娇, 等. 慢性支气管炎患者下呼吸道感染病原菌分布及耐药性分析 [J]. 现代生物医学进展, 2015, 15 (19): 3683-3685, 3697
Chen Wei-wei, Lei Li, Dang Hui-jiao, et al. Study on the Distribution and Drug Resistance of Pathogenic Bacteria of Lower Respiratory Tract infection in Patients with Chronic Bronchitis [J]. Progress in Modern Biomedicine, 2015, 15(19): 3683-3685, 3697
- [3] 杨青, 俞云松, 孙自镛, 等. 2011 年中国 CHINET 呼吸道病原菌分布和耐药性监测[J]. 中国感染与化疗杂志, 2013, 13(5): 357-364
Yang Qing, Yu Yun-song, Sun Zi-yong, et al. Distribution and antimicrobial resistance of common pathogens isolated from respiratory tract in CHINET 2011 surveillance in China[J]. Chinese Journal of Infection and Chemotherapy, 2013, 13(5): 357-364
- [4] Petraitiene S, Alasevicius T, Staceviciene I, et al. The influence of *Streptococcus pneumoniae* nasopharyngeal colonization on the clinical outcome of the respiratory tract infections in preschool children [J]. BMC Infect Dis, 2015, 15(1): 403
- [5] Xu Q, Casey JR, Newman E, et al. Otitis-prone Children Have Immunologic Deficiencies in Naturally Acquired Nasopharyngeal Mucosal Antibody Response after *Streptococcus pneumoniae* Colonization[J]. Pediatr Infect Dis J, 2016, 35(1): 54-60
- [6] 唱丽敏, 周丽琴, 孔丽清, 等. 儿科病房呼吸道感染患者的病原菌分布及耐药性分析[J]. 中国妇幼保健, 2014, 29(29): 4759-4761
Chang Li-min, Zhou Li-qin, Kong Li-qing, et al. Analysis on pathogen distribution and drug resistance of respiratory tract infections in pediatric ward [J]. Maternal & Child Health Care of China, 2014, 29(29): 4759-4761

- [7] 王晓丽, 俞赵军, 缪琪, 等. 儿科患儿医院呼吸道感染病原菌分布及耐药性分析[J]. 中华医院感染学杂志, 2014, 14(22): 5673-5675
Wang Xiao-li, Yu Zhao-jun, Miu Qi, et al. Distribution and drug resistance of pathogens causing respiratory tract infections in children of pediatric department[J]. Chinese Journal of Nosocomiology, 2014, 14(22): 5673-5675
- [8] Rosas-Salazar C, Gebretsadik T, Carroll KN, et al. Urine Club Cell 16-kDa Secretory Protein and Childhood Wheezing Illnesses After Lower Respiratory Tract Infections in Infancy[J]. Pediatr Allergy Immunol Pulmonol, 2015, 28(3): 158-164
- [9] Larkin EK, Gebretsadik T, Moore ML, et al. Objectives, design and enrollment results from the Infant Susceptibility to Pulmonary Infections and Asthma Following RSV Exposure Study (INSPIRE) [J]. BMC Pulm Med, 2015, 15: 45
- [10] Bergman P, Norlin AC, Hansen S, et al. Vitamin D supplementation improves well-being in patients with frequent respiratory tract infections: a post hoc analysis of a randomized, placebo-controlled trial[J]. BMC Res Notes, 2015, 8: 498
- [11] Mao S, Huang S. Vitamin D supplementation and risk of respiratory tract infections: a meta-analysis of randomized controlled trials [J]. Scand J Infect Dis, 2013, 45(9): 696-702
- [12] 陶红, 周建平. 母婴同室新生儿呼吸道感染的病原菌及耐药性探讨[J]. 深圳中西医结合杂志, 2015, 25(10): 184-186
Tao Hong, Zhou Jian-ping. The Explore of Rooming-in Newborn Respiratory Infection of Pathogenic Bacteria and Drug Resistance[J]. Shenzhen Journal of Integrated Traditional Chinese and Western Medicine, 2015, 25(10): 184-186
- [13] 黄玉莹, 晓君. 新生儿下呼吸道感染常见病原菌分布及耐药分析[J]. 吉林医学, 2016, 37(6): 1325-1326, 1327
Huang Wang-ying, Xiao Jun. Distribution and drug resistance of common pathogens causing lower respiratory tract infection in neonatal [J]. Jilin Medical Journal, 2016, 37(6): 1325-1326, 1327
- [14] Bielska DE, Kurpas D, Nitsch-Osuch A, et al. Exposure to environmental tobacco smoke and respiratory tract infections in pre-school children - a cross-sectional study in Poland [J]. Ann Agric Environ Med, 2015, 22(3): 524-529
- [15] Shih HI, Wang HC, Su JJ, et al. Viral Respiratory Tract Infections in Adult Patients Attending Outpatient and Emergency Departments, Taiwan, 2012-2013: A PCR/Electrospray Ionization Mass Spectrometry Study[J]. Medicine (Baltimore), 2015, 94(38): e1545
- [16] Breiman RF, Cosmas L, Njenga M, et al. Severe acute respiratory infection in children in a densely populated urban slum in Kenya, 2007-2011 [J]. BMC Infect Dis, 2015, 15: 95
- [17] 杨双丽, 汪红玲, 俞梅, 等. 患儿下呼吸道感染病原菌的临床调查与耐药性分析[J]. 中华医院感染学杂志, 2015, 15(16): 3805-3807
Yang Shuang-li, Wang Hong-ling, Yu Mei, et al. Clinical investigation of distribution and drug resistance of pathogens causing lower respiratory tract infections in children [J]. Chinese Journal of Nosocomiology, 2015, 15(16): 3805-3807
- [18] 吴世国, 印海燕. 1~3 月龄下呼吸道感染患儿致病菌与耐药状况研究[J]. 检验医学与临床, 2016, 13(8): 1052-1054
Wu Shi-guo, Yin Hai-yan. Study on pathogenic bacteria and drug resistance of infants aged 1-3 months old with lower respiratory tract infection[J]. Laboratory Medicine and Clinic, 2016, 13(8): 1052-1054
- [19] 徐星莉, 梁新文, 徐星榕, 等. 下呼吸道感染患儿常见病原菌分布与耐药性分析[J]. 中华医院感染学杂志, 2015, 15(2): 441-442, 448
Xu Xing-li, Liang Xin-wen, Xu Xing-rong, et al. Distribution and drug resistance of common pathogens causing lower respiratory tract infections in children [J]. Chinese Journal of Nosocomiology, 2015, 15(2): 441-442, 448
- [20] 倪莎莎, 吕菊红, 李雪琴, 等. 支原体肺炎患儿细胞免疫功能及肺功能状态变化的临床研究 [J]. 现代生物医学进展, 2016, 16(25): 4896-4898
Ni Sha-sha, Lv Ju-hong, Li Xue-qin, et al. Study on the Changes of Cellular Immunity and Pulmonary Function State of Children with Mycoplasma Pneumonia [J]. Progress in Modern Biomedicine, 2016, 16(25): 4896-4898

(上接第 2507 页)

- [18] 张苗, 汪彩英, 李霞, 等. 子宫内膜分型与厚度对不孕患者促排卵治疗后妊娠率的影响[J]. 中国性科学, 2016, 25(3): 118-120
Zhang Miao, Wang Cai-ying, Li Xia, et al. Effect of endometrium types and thickness on the pregnancy rate of infertility patients after ovulation induction treatment[J]. Chinese Journal of Human Sexuality, 2016, 25(3): 118-120
- [19] 陈小燕. 阴道超声在检测不孕症患者卵泡发育和排卵情况及子宫内膜厚度中的应用[J]. 临床医学工程, 2016, 23(6): 705-706
Chen Xiao-yan. Application of Transvaginal Ultrasound in Detection of Follicular Development, Ovulation and Endometrial Thickness in Patients with Infertility[J]. Clinical Medical & Engineering, 2016, 23(6): 705-706
- [20] 叶新, 李洋. 经阴道超声监测育龄女性卵泡发育评估不孕症的临床价值[J]. 中国现代医生, 2016, 54(2): 5-7
Ye Xin, Li Yang. The clinical value of transvaginal ultrasound in monitoring the ovarian follicular development and evaluating infertility of women in childbearing age [J]. China Modern Doctor, 2016, 54(2): 5-7