

The Prevalence of Nasopharyngeal Colonization and Antimicrobial Susceptibility of Streptococcus Pneumonia Isolated from Children in Hospital 17 Shahrivar in Rasht

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Abstract

Introduction and objective: streptococcus pneumonia is the most common cause of community acquired bacterial respiratory tract infection. It is also a major cause of acute otitis media, bacteremia and meningitis. There are few data on antibiotic-resistant streptococcus pneumonia in Iran. The aim of our study was to determine prevalence of nasopharyngeal carrier of streptococcus pneumonia and their antibiotic resistance pattern in children.

Material & Methods: This cross sectional study was performed between June 2011 to June 2012 on children from 3 month to 12 years old attending 17 Shahrivar Hospital in Rasht were studied. Nasopharyngeal samples were collected by sterile swabs and placed on Stewart plate then inoculated on selective agar, after that microbiological tests were performed and antimicrobial sensitivity tests were done.

Results: among 372 children, 203 (54.56%) were boys and 169 (45.44%) were girls and the mean age was 56.82 month. The carriage prevalence was 12.1%. High prevalence were seen in winter (18%) and autumn (17%), respectively. The high antimicrobial resistance were seen in Co-trimoxazol (86.6%), Erythromycin (68.8%), Penicillin (55.5%), cloxacilin (51.1%) and low resistance were seen in vancomycin (6.6%), chloramphenicol (6.6%), cefuroxime (11.1%), ceftriaxone (13.3%). pneumococcal carriage was not associated with sex, area life, parental smoking, maternal educational level, or breast-feeding and it was associated with antibiotic use 1 month before study, having fever and going to kindergarden.

Conclusions: Although the rate of the carrier nasopharyngeal pneumococci in this study was low, The resistant rate to the antibiotics was high. In order to avoid of excessive antibiotic use and subsequently high rate of resistance, enough education not only to the physicians but also general population is necessary. also it is necessary to vaccinate all children with the age less than 2 years for streptococcus pneumonia.

Keywords: Streptococcus pneumonia, Prevalence, Antibiotic-resistant, Nasopharyngeal carriers.

Introduction

Streptococcus pneumoniae or pneumococcus commonly colonizes upper air tract and perhaps it causes upper respiratory tract infection (like media otitis, sinusitis) or invasive Pneumococci is most prevalent cause of Bactrim and middle otitis, and the second reason of meningitis in children. After the public vaccination in US with Konjoge vaccine, pneumococcus has turned to the second common cause of meningitis in children and the most prevalent cause of meningitis in adults (Ferreira 2001). The importance of this bacteria has been increased with global emergence of resistant strains to penicillin and some other drugs. The initiation of public vaccination of infants from 2000 by seven valent Konjoge vaccine, can have significant effects on epidemiology of this organism according to reduction in nose-throat carriers, serotype changes, decreased antibiotic resistance among pneumococci causing pathologies and decrease of prevalence of pneumococci illnesses in children and likely unvaccinated adults. (Khataee 2002)

Problem Statement

On the basis of above lines, Streptococcus pneumoniae (pneumococcus) is normal flora of nose and throat (ENT) among children. Pneumococcus usually colonizes healthy children mucus membrane, Nazopharynx and their throat and it is a common pathogen in causing upper respiratory tract infection (acquired of community) which includes acute otitis media, chronic bronchitis, acute bacterial sinusitis and pneumonia because pneumococcus can diffuse from colonized regions to mucus tissue and cause mucus infections or invade to blood flow and raise bacteremia and meningitis. If the amount of pneumococcus carriers in a community is high, side effects and dependent diseases to Streptococcus pneumoniae is higher, it has also been found in some studies that features, serotype and sensitivity pattern in asymptomatic carriers of nasopharyngeal is analog to offensive specimen (Dudley 2001). Pneumococcus is the most prevalent cause of bacterial pneumonia and bacteremia in children and it causes about 30% of bacterial sinusitis and 40% of acute otitis media. Before the beginning of vaccination against pneumococcus at 2000 in United States of America, the rate of incidence with invasive infections was in the range of maximum 11-6 months and 540 cases among healthy children. World Health Organization (WHO) has estimated that in 2000, there were 716,000 deaths related to pneumococcal in children younger than 5 years old, so that, at least one million children die because of Streptococcus pneumoniae each year. Increase of resistance of pneumococcal to penicillin in recent years has turned to a significant problem for physicians, pharmacists and health agencies. Treatment of Streptococcus pneumoniae resistant to penicillin (PNSSP: penicilline-nonsusceptible S. pneumoniae) has transformed to a serious challenge and reports about failure in cure

with multi drug method(MDRSP: multi drug resistance)has been increased and this resistance has turned to a major health problem in most of countries of the world. According to the fact that selecting a good empirical treatment is itself on the basis of awareness of microbial sensitivity pattern, nowadays, monitoring of pneumococ colonization cases and its resistant types in society has been transformed to a health requirement (Timothy 2010). By noticing the fact that during recent years, few articles and reports has been published about this topic in Iran, so we have done this research about “determining the frequency of pneumococcal colonization in Nazopharynx and its antibiotic sensitivity among children registering in Rasht hospital 17 shahrivar, in order to specify the colonization of this bacteria in addition to its anti- microbial sensitivity. (Yu 2005)

Previous Research

1. *Osman Abdolahi and his colleagues from 2006 October to 2008 december have screened and sampled from among 2840 children in country that referred to health center and city demographic supervision of kilifi in Kenya by Nazopharynx and put the sample on the sterile cotton swap that at that situation,the prevalence of carriers is 65.8% which was the most value in 6 to 11 months children (79%) and the least incidence was observed in 54 to 59 months children.carriage has a positive relation with Corisa and negative relation with recent taking of antibiotic.53 serotypes were found that 42% of them were applied in 10 valentpneumococ vaccine(10-valent PCV).The prevalence of common serotypes decrease by increasing the age while this wasn't true about rare serotypes.*

2. *In a study that Dr.khataei and colleagues had conducted in 2002, the colonization of pneumococ in nose and throat of 150 2months patients aging 2 to 5 years were examined. These subjects didn't received any type of antibiotic and by recognizing antibacterial infection were hospitalized and treated ampicillin antibiotics or kiflin or they were without any type of aminoglycosides. In these patients the cultivation of pneumococ in nose and throat on the first day of hospitalization and 4-5 days after treatment with antibiotic was done. In 46 cases of patients the sample was positive according to existence of pneumococci which were tested by usual method of antibiogram,10 of them were intermediate sensitive ,28 were sensitive to penicillin and 8patients were resistant. In the second cultivation of nose and throat of subjects after 4-5 days hospitalization,8 ones were reported to be positively sensitive to penicillin and 12 resistant ones and 130 of them were negative. For 20 resistant ones in the first and second stage, MIC(minimal Inhibitory concentration) to penicillin was determined.4 ones of patients that have*

negative cultivation on the first day, turned to be positive after 4-5 days treatment by antibiotic and all of penumococs were resistant to penicillin. All of them concluded that during the treatment of children's infections with different antibiotics, throat and nose may rapidly colonized by resistant penumococs and in this way, it reinforces resistant strains ,therefore pediatricians must be aware of accurate and appropriate use of antibiotics.

3. *In a study which was done by Al-tawfiq during a retrospective examination in 1999 to 2004 in Saudi Arabia, obtained penumococs from 141 hospitalized children were checked according to antibiotic resistance. From among all of the penumococ samples,57.6% were sensitive to penicillin,28.8% were intermediate sensitive and 13.7% were resistant. During the study,highresistence of penumococs to penicillin in 1999 was :0% in 1999,in 2001:23% and in 2004:3.4%. intermediate resistance to penicillin was: 21% in 1999, 41% in 2001 and 27.6% in 2004.The amount of resistance to other antibiotics are: Erythromycin 33.4%,Tetraciclín 30% ,tri-methoperim-sulphametoxazol 40% and clindamycin 21.6%. all the samples were sensitive to ceftriaxone and vancomycin.*

Research Methodology

372 three months to 12 years children that referred to Rasht 17 shahrivar emergency and clinic center at office hours from beginning of 1390 ordibehesht to the beginning of 1391 ordibehesh were examined. The results are available in the form of sampling and collection method has been recorded as questionnaire. Calculation of sample volume and its number: the amount of p was according to Dr.khataee and his colleagues' study. (Waters 2007)

Methods of data analysis

The method for analysis of data is descriptiveand analytical.

Findings

Penumococ transmits from respiration droplets and often from person to person,for instance from mother to child or other child at home.in this study, the colonization of penumococ was more at cold seasons of year, fall and winter(summation of two seasons was 73% from among 45samples) that followed pervious known models.in this study, there wasn't a significant relation between two groups(a group fed with breast milk and milk)according to prevalence of pneumococci, as we noted it in past studies (Abdullahi 2012). Although, breast milk hasn't a considerable effect in decreasing pneumococci, but we cannot ignore its probable biologic impacts in this field and it is recommended to do more extensive studies in this area. In this

research, it was found that taking antibiotic can reduce pneumococci colonization in throat that is consistent with previous researches and it can be said the consuming antibiotic is considered as a kind of prophylaxis, though it isn't recommended for people with normal immune system but it is recommended for especial people including splines, sickle cell anemia, Humeral immune defect and deficiency of complement parts (Bakhshae 2006). However with quick establishing of resistant strains of pneumococci to penicillin especially in children that received low dosages of antibiotic for long period, we can't be sure to prevent disease by consuming prophylaxis. High risk children (above mentioned) with fever should be examine immediately and without considering background prophylaxis or vaccination (even done) must be cured by antibiotics. In this study, there was a significant relation between the presence of children in kindergarten and increase of pneumococci colonization. This fact presence in human gatherings lead to increase colonization or even catching pneumococci has been noted in last studies too (Neuman 2001). Fever or increase of colonization has a significant and meaningful relation that doesn't have any disagreement with studies (Jenkins 2008). Abdolahi and his colleagues that had screened 2840 children from October 2006 to December 2008 who referred to health center and demographic supervision of kilifi in Kenya and sampled by nazopheranx and they saw that carriage has a positive relation with corisa and negative accompany with recent antibiotic consumption. It was found in this research that general prevalence of pneumococci colonization among 3 months to 12 year children is 12.1%. Several studies were conducted in this field at different regions, for example; Bakhshaei and others reported in Mashad in 2006 that prevalence of throat pneumococci in children below 6 years old kindergarten children equals 8.78%. On one hand, Khataie et al. that have done a research on 2 to 5 year old children with bacterial disease, hospitalized in children medical center, have specified this prevalence 30.6%. It was seen in the present study that 51.11% (23 cases) of separated pneumococcus in children throat were resistant microbes to some types of antibiotics (MDRSD). Most of resistance cases were related to some kinds of antibiotics including cotrimoxazol, Ampicillin and Erythromycin. This finding shows that antibiotic resistance still rises so that in Yu et al study, the prevalence of resistant pneumococcus to penicillin was 26% in 2000-2001 and 21% in 2002-2003 and 31.5% in 2004-2005. In this study, resistance to penicillin was observed in 57.77% (26 cases) that is more than previous studies in developed countries but is less than Thailand which may show more resistant species in developing countries. Erythromycin is a kind of macrolide antibiotic which through connecting to bacterial 50s ribosomal subunit cause to lengthen bacteria's polypeptide (inhibition of protein making) (Huebner 2000). Resistance to this macrolide is increasing quickly and in this study, 68.88% of

pneumococci were resistant to Erythromycin that is similar to previous results (in china 83.6% and in Thailand 56%, (23,9)). In the present research, resistance to ampicillin was observed in 55.55% and in co-amoxiclav it was 22.22%. As such antibiotics like penicillin, ampicillin, erythromycin and even co-amoxiclav has been consumed extensively and sometimes without indication in all of upper respiratory diseases such as pharyngitis, media otitis and lower respiratory system and pneumonia with or without physician permission and in the cases that treatment is correct, the course of treatment isn't be completed by the patient and we can conclude that resistance to many types of antibiotics isn't so far and if we continue this process, it will be turned to a major health problem soon. (Ongkasuwan 2008)

Conclusions

According to above findings, it can be concluded that in 17 shahrivar educational center and probably in Rasht, there are considerable number of children particularly younger than 5 years old which are carriers of pneumococci and also antibiotic resistance is prevalent in them. Also, our suggestion for treatment of pneumococci infections in this center is vancomycin, ceftriaxone or cefotaxim and chloramphenicol.

Suggestions of Research

1. Studies like this with more sample volumes and sample selection design from healthy children in community and by determining prevalent serotypes and especially recognizing types with more pathological characteristics and high resistance that show against antibiotic will be done and because of changes in pathogenic, they must repeat every few years.
2. Physicians take more care in prescribing antibiotics and if they doubt to pneumococci, it's better to employ antibiotics that have more efficiency and if they are applied for outpatients, they should learn parents to take drugs accurately and on time until they finish.
3. Maybe it is the time for us to vaccinate our children against pneumococci along with developed countries.
4. We should ask the mass media, health centers, nurses and everyone who contributes with health and treatment to take efforts in order to teach community not to use Antibiotics arbitrary.

Limitations of Research

1. How to properly sampling without contamination.
2. Immediate transfer of samples taken from children's nose and throat was the main limitation of this study. With the appointment of a responsible staff or applying standard conditions at the transmission time especially using transmission culture, we have tried to eliminate this problem.

References

1. Abdullahi O, Karani A, Tigoi CC, et al. The prevalence and risk factors for pneumococcal colonization of the nasopharynx among children in Kilifi District, Kenya. *PLoS One*. 2012;7(2):e30787. Epub 2012 Feb 20.
2. Al-Tawfiq JA. Antibiotic resistance of pediatric isolates of *Streptococcus Pneumoniae* in a Saudi Arabian hospital from 1999 to 2004. *Med Sci Monit* 2006; 12(11): CR471-75.
3. American Academy of Pediatrics : Recommendations for the prevention of *Streptococcus pneumoniae* infections in infants and children: use of 13-valent pneumococcal conjugate vaccine (PCV13) and pneumococcal polysaccharide vaccine (PPSV23). *Pediatrics* 2010; 126:186-190.
4. Bakhshae Mahdi, Qazvini Kiarash, Naderi Hamidreza et al. the prevalence of streptococcus pneumonia carriers in Nasopharynx in healthy under 6 children in mashad kindergartens and determining antibiotic resistance pattern in separated pneumococcus. *Journal of Iran ear, throat, nose and throat*. Volume XVIII, No. 45, Fall 2006, pp. 26-119.
5. Centers for Disease Control and Prevention : Licensure of 1 13-valent pneumococcal conjugate vaccine (PCV13) and recommendations for use among children—ACIP, 2010. *MMWR Morb Mortal Wkly Rep* 2010; 59:258-261.
6. Dudley S, Asne K, Winther B, Hendley JO. Bacterial pathogens of otitis media and sinusitis. Detection in the nasopharynx, with selective agar. *Journal Laboratory Clinical Medical* 2001 ; 138:338-42.
7. Ferreira LL, Carvalho ES, Berezin EN, et al. Nasopharyngeal colonization and antimicrobial resistance of streptococcus pneumoniae isolated from children with acute rhinopharyngitis *J Pediatr (Rio J)* 2001; 77(3): 227-34.
8. Huebner RE, Wasas AD, Klugman KP, et al. Prevalence of nasopharyngeal antibiotic-resistant pneumococcal carriage in children attending private paediatric practices in Johannesburg. *S Afr Med J* 2000; 90(11): 1116-21.

9. Jenkins SG, Brown SD, Farrell DJ. Trends in antibacterial resistance among *Streptococcus Pneumoniae* isolated in the USA: update from PROTEKT US Years 1-4. *Ann ClinMicrobiolAntimicrob* 2008; 7: 1.
10. Khataee(2002). Research called pneumococci colonization in nose and throat during some days after antibiotic treatment in hospitalized children at Department of Pediatric Infectious,12th year,no.3,pp 45-8.
11. Neuman MI, Harper MB: Time to positivity of blood cultures for children with *Streptococcus pneumoniae* bacteremia. *Clin Infect Dis* 2001; 33:1324-1328.
12. Ongkasuwan J, Valdez TA, Hulten KG, et al: Pneumococcal mastoiditis in children and the emergence of multidrug-resistant serotype 19A isolates. *Pediatrics* 2008; 122:34-39.
13. Waters AM, Kerecuk L, Luk D, et al: Hemolytic uremic syndrome associated with invasive pneumococcal disease: the United Kingdom experience. *J Pediatr* 2007; 151:140-144.
14. Yu S, Yao K, Zhang W, et al. Serogroup distribution and antimicrobial resistance of nasopharyngeal isolates of *Streptococcus pneumoniae* among Beijing children with upper respiratory infections. (2000-2005). *Eur J ClinMicrobiol Infect Dis* 2008; 27: 649-55.
15. Timothy R.peters and jon Abramson . *Streptococcus Pneumoniae* (pneumococcus). In: Kliegman RM, Behrman RE, Jenson HB, Stanton BF, editors. *Nelson textbook of pediatrics*. 19th ed. Philadelphia: Saunders; 2011. p.910 -914
(2)Kaplan SL, Barson WJ, Lin PL, et al: Serotype 19A is the most common serotype causing invasive pneumococcal infections in children. *Pediatrics* 2010; 125:429-436.