ORIGINAL ARTICLE

Are Antibiotics Needed for Common Throat Infections?

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ABSTRACT

Objective: Ever fuelling antibiotic use and resulting resistance is still prevalent in our society most commonly prescribed for throat infections. However community acquired throat infections are known to be caused mostly by viruses, therefore it was of interest to determine the incidence of bacterial species grown from infected throats and whether the character of these isolates indicated antibiotic intervention to control ever increasing antibiotic resistances.
Design: Prospective Study.
Place and Duration: At a private Lab and Diagnostic Centre, Karachi, Pakistan during Jan 2010 to July 2011.
Method: The isolates from 362 patients of all ages presenting with RTI were cultured and identified using standard protocol. Antibiotic sensitivity of these isolates was checked using 23 drugs and the Kirby-Bauer disc diffusion method at a private lab in Karachi. In addition, to know the perspective of ENT specialists regarding the antibiotic resistance, rate of their prescriptions and the drugs they prescribe, 30 questionnaires were also collected.
Results: Among the 362 isolates Pneumococci were most commonly seen (35.34%) followed by Staphylococcus aureus (23.01%) and notable Klebsiella pneumoniae (14.5%). The ENT physicians interviewed commonly prescribed any of 20 antibiotics, most often Amoxicillin, Amoxiclav or even the injectables Cefotaxime, Ceftriaxone for pharyngitis. In our study, among others, the isolates were most sensitive to Cefotaxime (91.2%), Ceftriaxone (91.0%) and Amoxiclav (80.4%) followed by Penicillin (71.0%). Erythromycin (43.1%) and Cefixime (30.7%) were less effective.
Conclusion: Pneumococci and Staphylococci were most often isolated from infected throats; these were likely part of residential flora accompanying infecting respiratory viruses, the drug therapy was hence superfluous and essentially harmful.

Key words: Pharyngitis, Tonsillitis, Isolates, Antibiotics, Resistance.

INTRODUCTION

The rising antimicrobial resistance has become a global health concern. Respiratory tract infections are the most common of all infections occurring and being documented.[1-2] Recurrent respiratory tract infections (RRTI) especially in children are a health concern globally and most of the times these RRTI are caused by viral pathogens where multiple antibiotic courses are prescribed which show no effectiveness rather increase bacterial resistance to antibiotics.

Choice of antibiotics prescribed for usual pathogens causing throat infections by clinicians is usually empirical. Streptococcus pneumoniae, Haemophilus influenzae and Moraxella catarrhalis are the major bacterial pathogens implicated in community acquired respiratory tract infections.[3-4] Among these pathogens S. Pneumoniae has become resistant to various classes of antibiotics, including penicillins, macrolides, co-trimoxazole and flouroquinolones.[5-6] For commonly prescribed antibiotics the resistance levels of 84% have been reported for co-trimoxazole, 52% for penicillin, and 25% for ampicillin.[7-8]

Availability of antibiotics over the counter at most pharmacies is another concern which has fuelled the misuse of antibiotics and resulted into rapid emergence of resistance during the recent decades. A recent study shows that antibiotics are dispensed without a medical prescription in 77.6% of the pharmacies in which sore throat and diarrhea are the chief complaints (90%) for which the antibiotics are dispensed.[9] A local study regarding antibiotic treatment of URTIs in children at Karachi showed that most of the physicians (84%) were aware about the antibiotic resistance from its overuse but despite this knowledge physicians were found prescribing antibiotics presumptively due to

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many social reasons, the rationale for such presumptive antibiotic courses were mainly the following, meeting parental expectations (35%), fear of losing patients (24.7%), convenience of prescription of antibiotic as compared to explaining the course of the illness (33%) and avoiding the cost of a return visit (26%).[10] These issues have led to increased difficulties in the treatment and control of developing resistant pathogens. Studies have shown that antibiotic resistance changes according to the geographical location as well as over the time.[11-12] It is therefore of interest to find out susceptibility patterns of pathogens to commonly prescribed antibiotics at Karachi over this time to update the knowledge of antibiotics use for the management of URTIs at Karachi.

MATERIALS AND METHODS

The study was carried out at a local diagnostic lab at Karachi, Pakistan for the period of one and a half years during January 2010 till July 2011. The patients were taken consent to include their data into research during throat swab sampling. Throat swabs were taken and tested for antibiotic susceptibilities from patients of all ages and both genders at a private Lab and Diagnostic Centre, Karachi. Senior highly skilled nurse were given the job of taking throat swabs. A total of 362 throat swabs were taken during this period. The samples taken were tested for antibiotic sensitivity patterns for 23 different drugs using Kirby-Bauer disc diffusion method.

The inclusion criterion was the presence of URTI being referred to the hospital or a doctor. The chief complaints of the patients were sore throat and runny nose. The patients who have taken any antibiotics for the past 4 weeks were excluded from the study.

For Kirby-Bauer disc diffusion method; colonies from samples were grown on different agars including chocolate agar, blood agar and eosin methylene blue agar. Some amount each of sample was inoculated into these agars and was incubated at 37^0C for 24-48 hours in aerobic environment except that of chocolate agar which was kept at 5-10% CO_2 atmosphere. After the incubation period macroscopic and microscopic examination of the colonies grown on plates was done. Questionable cultures were purified by growing them in appropriate solid culture media which were stored at 4^0C for further analysis. Presumptive identification was done based on the cultural and morphological characteristics of pure culture on selective and differential media. To confirm the isolates, standard microbiological techniques and biochemical tests were done using API 20E kit.

A slight inoculum of each bacterial isolate was placed in four ml of normal saline in bijou bottles; their density was than compared with barium chloride standard (0.5 McFarland). Mueller-Hinton agar plates were evenly inoculated with standardized solutions of bacterial cultures by the help of sterile cotton swabs and were allowed to dry up. Later on, antibiotic discs with the following drug contents – amoxiclav (20/10 µg), amoxicillin (20 µg), imipenem (10 µg), amikacin (30 µg), cefotaxime (30 µg), piperacillin/tazobactam (100/10 µg), cefixime (5 µg), ceftazidime (30 µg), ceftriaxone (30 µg), fosfomycin (200 µg), clindamycin (2 µg), ofloxacin (5 µg), enoxacin (10 µg), ciprofloxacin (5 µg), sparfloxacin (5 µg), doxycycline (30 µg), cefuroxime (30 ìg), oxacillin (1 µg), Tobramycin (10 µg), erythromycin (15 ìg), gentamicin (10 ìg) and penicillin (10 IU) were placed on the appropriate plates using standard forceps, properly spacing them to prevent any overlap. To determine susceptibility and resistance, the diameters in plates were compared with defined diameters of the control organism – Staphylococcus aureus ATCC 25923 Biosafety level (BSL) 2 after incubating the plates at 35^0C for 24 hours.

In addition questionnaires from 30 ENT specialists were being collected to ascertain their perceptive of possible pathogen causing URTI and also their drug preferences for empirical therapy. ENT specialists required to fill the questionnaires were mainly practicing in two busy public sector tertiary care hospitals in Karachi namely Jinnah postgraduate medical center and Civil hospital.

RESULTS

The Frequency of isolates identified from throat swabs is given in table 1. Among 362 isolates, aside from irrelevant Neisseria species (17.80%), Pneumococci were most commonly seen (35.34%) followed by Staphylococcus aureus (23.01%) and notable Klebsiella pneumonia (14.5%). Candida albicans were grown from 5 throat swabs. Other isolates identified were Pseudomonas aeruginosa (4.38%), Moraxella catarrhalis (1.09%) and E.coli (1.64%). Streptococcus pyogenes and Hemophilus influenzae were infrequently encountered.

Table:1 Frequency of Isolates identified from throat swabs

S.No.	Isolates	No.	Percentage
1	Pseudomonas aeruginosa	16	4.38
2	Pneumococci	129	35.34
3	Moraxella catarrhalis	4	1.09
4	Neisseria subflava	65	17.80
5	Staphylococcus aureus	84	23.01
6	Klebsiella pneumoniae	53	14.5
7	E.coli	6	1.64
8	Candida albicans	5	1.36
Total:		362	

Table:2 Antibiotic Sensitivity Patterns for the antibiotics currently available in pharmacies

No.	Antibiotic		Sensitive	Resistant	Total	Percentage
	Name	Code	(S)	(R)		(%)
1	Amikacin	(AK)	70	7	77	90.9
2	Gentamicin	(CN)	113	232	345	32.07
3	Tobramycin	(NN)	37	70	107	34.57
4	Amoxicillin	(AML)	168	184	252	66.66
5	Amoxiclav (Augmentin)	(AMC)	284	67	353	80.45
6	Imepenem	(IPM)	59	2	61	96.72
7	Piperacillin+Tazobactam	(TZP)	42	3	45	93.33
8	Cephradine (Velocef)	(V)	182	171	353	51.55
9	Cefuroxime	(CXM)	277	67	344	80.52
10	Cefixime	(CFM)	107	241	348	30.74
11	Cefotaxime	(CTX)	313	30	343	91.25
12	Ceftazidime	(CAZ)	95	23	118	80.50
13	Ceftriaxone	(CRO)	295	29	324	91.04
14	Fosfomycin	(FOS)	283	66	349	81.08
15	Ofloxacin	(OFL)	158	87	245	64.48
16	Enoxacin	(ENX)	158	82	240	65.83
17	Ciprofloxacin	(CIP)	157	84	241	65.14
18	Sparfloxacin	(SPX)	173	68	241	71.78
19	Doxycycline	(DOX)	32	213	245	13.06
20	Septran	(SXT)	52	267	319	16.30
21	Penicillin	(P)	27	11	38	71.04
22	Erythromycin	(ER)	22	29	31	43.13
23	Lincomycin	(LN)	30	33	63	47.61

Table: 3 Number of Isolates in specific age group

Age Group	1-20 years	20-40 years	40 years and onwards
Total No. of Isolates	135	127	78
S. Aareus	43 (31.8%)	25 (19.6%)	10 (12.8%)
K. Pneumoniae	14 (10.3%)	11 (8.6%)	1 (1.2%)
P. aeruginosa	4 (2.9%)	6 (4.7%)	3 (3.8%)
E.coli	3 (2.2%)	2 (1.5%)	1 (1.2%)

The ENT physicians interviewed commonly prescribed any of 20 antibiotics, most often Amoxicillin, Augmentin, Sparfloxacin, Erythromycin or even the injectables Cefotaxime, Ceftriaxone, and Amikacin for tonsillitis/pharyngitis.

Antibiotic sensitivity patterns tested on the isolates are given in table 2. In our study, the isolates were most sensitive to Imepenem (96.7%), Pipericillin+ Tazobactam (93.3%), Cefotaxime (91.2%), Ceftriaxone (91.0%), Fosfomycin (81.0%), Cefuroxime (80.5%) and Augmentin (80.4%), followed by Penicillin (71.0%), Amoxicillin (66.6%), and Ciprofloxacin (65.1%). Erythromycin (43.1%), Cefixime (30.7%), Cotrimoxazole (16.3%) and Doxycycline (13.0%) were less effective.

DISCUSSION

This study focused on prevalence of bacterial pathogens causing URTIs and their antibiotic susceptibility patterns. Noteworthy in the present study is that H. influenza and S. pyogenes which are known to be the leading causes of RTIs were not isolated.[11,13-14] In another study isolation rates for Group A and B Streptococci (8%) were low and reported the use of antibiotic injudicious.[15] In this study isolation rates of 23.01% and 14.5% were noted for S. aurues and K. pneumoniae respectively which were also implicated as significant causes of URTIs in previous studies.[11,14,16] Our study is thus in harmony with previously done studies regarding the prevalence of bacterial pathogens.

Present study showed high isolation rates for S. aureus and K. pneumoniae in younger age group of 1 to 20 years, 31.8% and 10.3% respectively as compared to adult age group of 20 to 40 years in which the isolations rates were 19.6% and 8.6% respectively as shown in table 3. A study in the Gambia also showed a higher prevalence of URTI pathogens in young children as compared to that in adults.[17] Sazawal S and Black RE,

2003 are of view that young children are the most susceptible to cold therefore URTI spreads rapidly among youngsters.[2] Our study showed the same pattern of prevalence of pathogens as was highlighted in previous studies, therefore high risk young age group is more vulnerable to URTIs because of the predisposing factors such as under nourishment, less sleep and humid weather which may easily give way to viruses to cause infection and can lead to secondary bacterial infection by pathogens already present with normal flora.

However in this study Pneumococci (35.34%) and Neisseria (17.80%) were also frequently isolated from infected throats; these were likely part of residential flora accompanying infecting respiratory viruses, and that drug therapy in such cases was hence superfluous and essentially harmful. It's a widespread agreement that viral pathogens are the initiators of the RTI and secondary bacterial infection is a sequel to the viral initiation.[18] Thus prescribing antibiotic courses to all the patients would cause more harm by increasing antibiotic resistance. Rather the antibiotics should be prescribed only to high risk groups in which secondary bacterial infections are likely. The major microbial pathogens isolated in secondary bacterial infections after severe influenza virus infection include Streptococcus Pneumoniae, Haemophilus influenzae, Staphylococcus aureus, Klebsiella pneumoniae, and Streptococcus pyogenes.[19] Additionally pathogens such as Pseudomonas aeruginosa and few species of the Enterobacteriaceae may also be islolated.[19-20] A study showed a 9.7% carrier rate for Group A Streptococci (GAS) in healthy screened children and 3.2% and 2.2% carrier rates for Group G and Group C streptococci respectively[21] which indicates rational use of antibiotics be implemented to minimize resistance against GAS, consistent with theme of this study.

The major reason facilitating the emergence of antibiotic resistance is their extensive use.[12] It is notable that Cefotaxime (91.25%), Ceftriaxone (91.04%), and Amikacin (90.9%) are less abused than other antibiotics because of their mode of administration which is by injection and their high prices. It may be because of these factors that low rate of resistance is recorded for such antibiotics. In contrast, because of high use, commonly bought over-the-counter antibiotics such as Penicillin (71.04%), Augmentin (80.45%) and Amoxicillin (66.66%) are becoming less effective to isolates over the period of time and more commonly available cheaper drugs like Erythromycin (43.1%), Cefixime (30.7%), Cotrimoxazole (16.3%) and Doxycycline (13.0%) have become inactive and not a good choice for the management of URTIs. Another study also showed that 95% of the isolates from infected throats were resistant to erythromycin.[22] This suggests a correlation between the antibiotic usage and the extent of drug resistance encountered in this study in accordance with a previous study.[12] Rapid diagnostic method for sore throats such as polymerase chain reaction (PCR) assays targeted for 13 URTI viruses may reduce antibiotic prescription rates at the initial visit in an outpatient setting[23] which can prove to be a good tool to reduce antibiotic prescription rates especially in our society where it has been the main driving force for fuelling emergence of antibiotics resistance. In Spain a study showed that physicians prescribed antibiotics to only 27.9% of patients with signs RTI, the criterion most associated with this prescription was the presence of tonsillar exudate followed by ear discharge and purulence of sputum, conversely cough was considered as protective factor.[24] The present study indicates the need of a similar pre-defined criterion for the prescription of antibiotics.

CONCLUSION

In conclusion routine request for PCR assays or Culture/Sensitivity check is preferred to ascertain whether a significant bacterial species is indeed the irritant, and its drug profile. Pneumococci and Neisseria were most often isolated from infected throats; these were likely part of residential flora accompanying infecting respiratory viruses, and that drug therapy was hence superfluous and essentially harmful. This study provides a baseline data for further studies on susceptibility patterns considering the fact that very few data is available on susceptibility patterns of pathogens causing URTIs in this locality despite of the fact that a very high rate of antibiotic overuse and misuse is reported. This study is therefore of clinical and epidemiological significance.

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Conflict of Interest: None declared.

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