

Antimicrobial Pattern of Various Upper Respiratory Tract Infections in Pediatric Age Group

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Conflict of interest: Nil

Abstract

Introduction: In developing countries like India, acute respiratory infection (ARI) is the major burden to child health. Upper respiratory tract (URT) is the common area which can prone for various infections. With these a study was conducted to find the various bacteria responsible for URTIs and also their antimicrobial pattern.

Methods: It was a prospective study conducted in GSL Medical College, Rajahmundry. School going children who were clinically diagnosed with URTIs were included in the study. Throat swab was collected from posterior pharyngeal wall and also from the tonsils. Swabs were transferred immediately to the microbiology laboratory. Samples were cultured as per the guidelines. Initially the growth was identified based on colony morphology and cultural characteristics then processed for Gram staining and also a battery of biochemical tests as per the protocol for the identification. Simultaneously antibiotic sensitivity testing was done on Kibry bauer disc diffusion method.

Results: Total 133 samples were collected, 49% (63) were male and 51% (70) were female. Gender wise, 31%, 45% were culture positive (CP), and 16.5%, 26.5% were culture negative (CN), in male, female, respectively; statistically there was no significant difference. Total 96 (100%) bacteria were isolated; 30% (29) were *Staphylococcus aureus*. No significant resistance was noted to higher antibiotics like imipenem, piperacillin tazobactam, vancomycin and linezolid.

Conclusion: URT infections are common among female children. *Staphylococcus aureus* is the predominant pathogen, no significant resistance was noted to higher antibiotics. Small sample size, short duration of the study are the limitations of the study.

Keywords: Infection, Bacteria, Respiratory.

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Introduction

In developing countries like India, acute respiratory infection (ARI) is the major burden to child health. [1] Infection to lower respiratory tract (LRT) is the leading cause of death in ARI. Worldwide, acute LRTs are responsible for 12 – 15% of ARI. [2 – 4]

Usually the upper respiratory tract (URT) infections are self limiting; limited number only may require antibiotic treatment. Especially in low and middle income countries, respiratory tract infections are considered to be the major public health problem. [5] Factors such as parents socioeconomic background, place of residence and household environment and so on can influence the incidence of URT. [6]

URT is the common area which can prone for various infections such as tonsillitis, pharyngitis, nasopharyngitis, otitis media and sinusitis; this can be a threat to all age group. [7] URT also may be mild but lead to morbidity and mortality. [8] With these a study was conducted to find the various bacteria responsible for URTIs and also their antimicrobial pattern. [9]

Methods

It was a prospective study conducted in GSL Medical College. Random sampling was considered in this study. Study was conducted for 6 months, September 2021 to February 2022. School going children who were clinically diagnosed with URTIs were included in the study. Non cooperative

children were not considered. All the individuals who satisfy the inclusion criteria during the study period were included in the study.

Throat swab was collected from the study participants from posterior pharyngeal wall and also from the tonsils. Swabs were transferred immediately to the microbiology laboratory for the later process. Samples were inoculated immediately on sheep blood agar, chocolate agar and Mac Conkey agar. The inoculated plates were incubated at 37°C overnight under 5% – 10% carbon dioxide atmospheres. The plates were observed up to 48 hours. If no growth was noted even after 48 hours of incubation, the culture was declared negative.

If there was any growth, initially the colonies were identified based on colony morphology and cultural characteristics then processed for Gram staining and also a battery of biochemical tests as per the protocol for the identification. Simultaneously antibiotic sensitivity testing was done on Kibry bauer disc diffusion method.[9]

Results:

During the study period, total 133 samples were collected. In this, 49% (63) were male and 51% (70) were female and the male female ratio was 0.9. Gender wise, 31%, 45% were culture positive (CP), and 16.5%, 26.5% were culture negative (CN), in male, female, respectively; statistically there was no significant difference (Table 1).

Table 1: Gender wise distribution of the study participants; n (%).

Gender	CP	CN	Total
Male	41 (31)	22 (16.5)	63 (47.5)
Female	45 (34)	35 (26.5)	70 (52.5)
Total	86 (64)	57 (43)	133 (100)
Statistical analysis	Chi square = 1.1462; P = 0.284351		
	Statistically not significant		

In this study, total 96 (100%) bacteria were isolated. Isolate wise, 30% (29) were *Staphylococcus aureus*, 12.5% (12) were *Streptococcus pyogenes*, 16% (15) were *Escherichia coli*, 22% (21) were *Klebsiella pneumoniae* and 20% (19) were *Pseudomonas aeruginosa* (Table 2).

Table 2: Bacterial isolates among the study participants.

Isolate	Number	%
<i>Staphylococcus aureus</i>	29	30
<i>Streptococcus pyogenes</i>	12	12.5
<i>Escherichia coli</i>	15	16
<i>Klebsiella pneumoniae</i>	21	22
<i>Pseudomonas aeruginosa</i>	19	20
Total	96	100

All the isolates showed good sensitivity to Ciprofloxacin, aminoglycosides. Sensitivity was poor to penicillins and cephalosporins. No significant resistance was noted to higher antibiotics like imipenem, piperacillin tazobactam, vancomycin and linezolid.

Discussion

In this report, CP results were 34% (45), 31% (41) respectively among the female and male. In CP cases the male, female ratio was 0.92 with female predominance. In a study by Mizrahi A et al. [8] out of the 1,110 clinical samples which were screened, 71.1% (789) were CP; in this, the investigators reported that 54.62% (431) were male participants and 45.37% (358) were female participants and the male female ratio was 1.2. Usually there was a common belief that in countries such as India, males are involved in more outdoor activity. Mizrahi A et al. study was conducted in 2014. [8] Where present research was conducted in 2022 and currently both gender is involved in the outdoor activity. So almost similar CP was detected among the gender in the current study. [8]

It was reported that age is an important factor that influence the flora of the URT. If there is any abnormality in this flora, automatically the pathogens start growing, cause infections. [10, 11, 12] With age, the URT infections are also should increase.

Whereas in this report, due to more outdoor activity, the rate of infections are more in some age groups. The other important issue was, among the children <5 years, URTI were reported to be the important cause of mortality. [13]

Bacteria, namely, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* were clinically important as they cause various infections. [14, 15, 16] Isolate wise, *Staphylococcus aureus* was the predominant pathogen (30%; 29) followed by *Klebsiella pneumoniae* (22%; 21), *Pseudomonas aeruginosa* (20%; 19), *Escherichia coli* (16%; 15) and *Streptococcus pyogenes* (12.5%; 12). In a study by Li ming et al. *Staphylococcus aureus* was reported to be the common pathogen that causes URT infections. [7] *Streptococcus pneumoniae* is the most common cause of URT infections. [17] But in this study we could not report the isolate, this is one of the limitations of the study. Studies reported a high prevalence of this. [18, 19]

In the available literature, different antibiotics sensitivity patterns were reported. Due to increase as well as indiscriminate usage of antibiotics, drug resistance is the burning problem. [20] But in this report, the isolates were sensitive to the commonly used antimicrobials and no significant drug resistance was identified.

Conclusion

URT infections are common among female children. *Staphylococcus aureus* is the predominant pathogen.

Limitations of the study: Small sample size, short duration of the study are the limitations of the study.

Author's contribution

1. Dasari Sandhya: Study design, literature search
2. Radha Lavanya Kodali: Sample collection, data analysis, proof reading
3. Golla Eshwara Chandra: Data analysis, literature search, article writing
4. Bollineni Prasad: Statistical analysis, article writing
5. T Jaya Chandra: Study design, bench work

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