TREATMENT PATTERN IN RESPIRATORY TRACT INFECTIONS: AN OBSERVATIONAL STUDY ON PAEDIATRIC POPULATION

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ABSTRACT

This study is conducted to identify the incidence and type of respiratory tract infections in children. To analyse the treatment patterns and pharmacological management of respiratory tract infection in children. This is prospective-observational study carried out at a pediatric clinic, Warangal for a period of four months from December to March (winter season). The study was approved by Institutional Ethical Committee. Overall 1400 patients data was collected and following results were obtained. Demographic details, social status, eating habits, treatment and comorbid conditions information was collected from patients. Among 1400 paediatric population, 17.64% were suffering from ARTI, 38.07% from AURTI, 6.78% are suffering from ALRTI, 7.64% are suffering from ARTI+OTHERS, 3.07% are came for Immunization and 26.78% are suffering from various reasons. The most commonly used antibiotics were amoxicillin, azithromycin, clotrimazole, colistin, and cephalosporin. Amoxicillin was the widely used antibiotic and highest percentage of amoxicillin use was observed at the age of 3.3-5 years of age i.e. 33%. Second choice of drug was azithromycin. We found that URTI is more commonly seen than other type of RTI. Symptomatic treatment is better for paediatric patients. Antibiotics are preferred only in patients who are clinically identified and confirmed suffering with bacterial infections. Penicillins (Amoxicillin) remains as a safe and effective antibiotic for treating respiratory tract infections in children.

KEYWORDS: paediatrics, respiratory tract infections, pharmacological management, antibiotics.
INTRODUCTION

According to NICE clinical guide 69, Respiratory Tract Infections (RTI) is defined as any infectious disease of the upper or lower respiratory tract. Upper respiratory tract infections (URTIs) include common cold, laryngitis, pharyngitis/tonsillitis, acute rhinitis, acute rhinosinusitis and acute otitis media. Lower respiratory tract infections (LRTIs) include acute bronchitis, bronchiolitis, pneumonia and tracheitis. Antibiotics are commonly prescribed for RTIs in adults and children in primary care.\[^1\]

Worldwide 85-88% of ARTI episodes are acute Upper respiratory infections while the rest are acute lower respiratory infections.\[^2\]

Acute respiratory tract infection is a major cause of morbidity and mortality in both developing and developed countries. In developing countries seven deaths out of ten under 5 years are due to ARTI. It is estimated that at least 300 million episodes of ARTI occur every year in India. Out of these 30 to 60 million are moderate to severe ARTI. Every 6\(^{th}\) child suffering with ARTI in the world is Indian and every 4\(^{th}\) child who dies is from India.\[^3\]

Antibiotics are mostly prescribed for the treatment of acute respiratory tract infections, otitis media, upper respiratory tract infections and sinusitis.\[^4\] Antibiotic use must be cautiously monitored and improper or overuse of antibiotics could lead to resistance in any age group people. Paediatric patients are specialty group and improper use of antibiotics may lead to further complications.

Our primary objective was to identify the paediatric patients suffering with RTI and to study the usage of antibiotics and other medications used for symptomatic relief in children. Unwarranted use of antibiotics is associated with increased resistance among bacteria that commonly cause ARTIs, posing risks to both individuals and communities.\[^5\] Hence our interest was to study the pattern of antibiotics and other category of drugs usage in paediatric patients. According to the NICE guidelines, delayed antibiotic prescribing and/or no prescribing as strategies are very effective compared with an immediate antibiotic prescribing strategy. Among antibiotics, pencillins are considered all over the world as first line treatment.\[^6\]
MATERIALS AND METHODS
A prospective-observational study was carried out at a paediatric clinic, Warangal for a period of four months from December to March (winter season). Patients from nearby places visit this hospital regularly for treatment of various health related problems. All patients diagnosed with respiratory tract infections and receiving treatment are included in this study. In-patients with critical health condition are excluded. 1400 Out-Patient prescriptions are collected and evaluated. Oral consent was taken for all the patient care givers/ patients. Demographic details, social status, eating habits, treatment and comorbid conditions and other pertinent information was collected from patients care givers.

RESULTS
Age: Of 1400 patients, 292 patients (21%) were of 0.1 – 1.5 years, 275 were of 1.6 – 3.2 years (20%), 287 were of 3.3 – 5 years (21%), 269 were of 5 – 6.5 years (19%), and 277 were of 6.6 – 7.5 years (20%). Patients among age group of 1 – 20 months are frequently visiting the clinic.

Infections: Among 1400 patients, 17.64% are suffering from ARTI, 38.07% are suffering from AURTI, 6.78% are suffering from ALRTI, 7.64% are suffering from ARTI+OTHERS, 3.07% are came for Immunization and 26.78% patients were with other health issues such as typhoid, AGE.

Among 1400 patients, majority of the patients are suffering from AURTI, followed by other conditions. Table 1 below shows the details of the distribution of diseases in overall patient population according to their age.

Table 1: Age wise disease condition.

<table>
<thead>
<tr>
<th></th>
<th>1month-1.5yrs</th>
<th>1.6yrs-3.2yrs</th>
<th>3.3yrs-5yrs</th>
<th>5yrs-6.5yrs</th>
<th>6.6yrs-7.5yrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARTI</td>
<td>27</td>
<td>9.24</td>
<td>65</td>
<td>23.6</td>
<td>58</td>
</tr>
<tr>
<td>AURTI</td>
<td>141</td>
<td>48.28</td>
<td>91</td>
<td>33</td>
<td>117</td>
</tr>
<tr>
<td>ALRTI</td>
<td>16</td>
<td>5.47</td>
<td>9</td>
<td>3.27</td>
<td>30</td>
</tr>
<tr>
<td>ARTI+Others</td>
<td>30</td>
<td>10.27</td>
<td>22</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>Immunization</td>
<td>8</td>
<td>2.73</td>
<td>15</td>
<td>5.45</td>
<td>5</td>
</tr>
<tr>
<td>Others</td>
<td>70</td>
<td>23.97</td>
<td>73</td>
<td>26.5</td>
<td>58</td>
</tr>
<tr>
<td>TOTAL</td>
<td>292</td>
<td>100</td>
<td>275</td>
<td>100</td>
<td>287</td>
</tr>
</tbody>
</table>

Antibiotics: The most commonly used antibiotics were amoxicillin, azithromycin, clotrimazole, colistin, and cephalosporin. Amoxicillin was widely used antibiotic and highest
percentage of amoxicillin use was observed at the age of 3.3-5 years of age (33%), followed by 5-6.5 years (30%), 1.6-3.2 years (17%), 6.6-7.5 years (13%) and the least is at the age of 01 month-1.5 years (7%). Second choice of drug was azithromycin, and it was prescribed highest in age between 3.3-5 years i.e. 35%, 6.6-7.5 years – 23%, 5-6.5 years – 21%, 1.6-3.2 years-13% and least was 8% of use in 1 month-1.5 years age of patient population.

Highest percentage of clotrimazole use was observed at the age of 3.3-5 years [28%], followed by 1.6-3.2 years [21%], 5-6.5 years [20%], 01 month-1.5 years [19%] and the least is at the age of 6.6-7.5 years [12%]. Colistin use was observed at the age of 3.3-5years [41%], followed by 1.6-3.2 years [26%], 5-6.5 years [22%], 6.6-7.5 years [7%] and the least is at the age of 01 month-1.5 years [4%].

Highest percentage of cephalosporins use was observed at the age of 5-6.5 years of age [31%], followed by 1.6-3.2 years [25%], 3.3-5 years [15%], 01 month-1.5 years [15%] and the least is at the age of 6.6-7.5 years [14%].

Overall antibiotic use is plotted in bar graph and it is observed that the age group between 3.3 – 5 years are prescribed with more number of antibiotics then other age groups.

![Figure 1: Usage of antibiotics.](image)

Other than antibiotics few other class of drugs such as, bronchodilators, nasal decongestants, antihistamines, antipyretics, antiemetics, antiprotozoals were used for symptomatic relief.
**Bronchodilators:** Highest percentage of bronchodilators [salbutamol] use was seen at the age of 5-6.5 years of age (32%), followed by 0.1-1.5 years (29%), 1.6-3.2 years (16%), 3.3-5 years (13%) and the least is at the age of 6.6-7.5 years (10%).

**Nasal decongestants:** Highest percentage of Nasal decongestants (NaCl, Xylometazol) usage was seen at the age of 3.3-5 years of age (24%), followed by 1.6-3.2 years (20%), 5-6.5 years (20%), 6.6-7.5 years (19%) and the least is at the age of 0.1-1.5 years (17%).

![Figure 2: Use of nasal decongestants.](image-url)

**Antihistamines and combinations** (Cetrizine/ Chlorpheneramine maleate/ Phenylephrine): Highest percentage of anti-histamine use was seen at the age of 5-6.5 years of age (22%), followed by 1.6-5 years (20%), and the least usage was observed at the age of 0.1-1.5 years (16%).

**Antipyretics:** Paracetamol is widely used in the age group of 0.1-6.5 years of age (21%), and the least at the age of 6.6-7.5 years i.e. 16%. Paracetamol was prescribed to almost all age groups but dose varied according to different type of disease conditions.

**Anti-ematics:** Highest percentage of anti-ematics [ondansetron] use was seen at the age of 1.6-3.2 years of age (28%), followed by 0.1-1.5 years (22%), 3.3-5 years (21%), 5-6.5 years (15%) and the least at the age of 6.6-7.5 years (14%).
**Antiprotozoals:** Highest percentage of albendazole use was seen at the age of 6.6-7.5 years (30%), followed by 5-6.5 years (28%), 3.3-5 years (20%), 1.6-3.2 years (15%) and the least is at the age of 0.1-1.5 years (7%).

**Probiotics:** Highest percentage of probiotics [bacillus] use was seen at the age of 0.1 – 1.5 years of age i.e. 38%, followed by 1.6 – 3.2 years (17%), 3.3 – 5 years (16%), and the least is at the age of 6.6 – 7 years i.e. 13%.

**Prescription pattern of drug use in pediatric population**

The drug use in paediatric patients varies according to the requirement of each individual patient. Mostly prescribed medications are listed in the table below. Among all medications, usage of combination drugs such as paracetamol + phenylephrine + chloramphenicol usage was 13 % followed by vitamin D₃ and calcium supplements with 11% use in entire patient population.

Highest percentage of drugs were prescribed in URTI (38.2%), followed by ARTI (26.9 %) and others 18.5%.

**Table 2: Prescription pattern of drugs in different disease conditions.**

<table>
<thead>
<tr>
<th>Drugs</th>
<th>ARTI</th>
<th>AURTI</th>
<th>ALRTI</th>
<th>RTI+ Others</th>
<th>Total RTI</th>
<th>Others</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amoxicillin+Clavulanic Acid</td>
<td>36</td>
<td>74</td>
<td>12</td>
<td>6</td>
<td>128</td>
<td>19</td>
<td>147</td>
</tr>
<tr>
<td>Amoxicillin+Guaniphenesin +L-Salbutamol</td>
<td>5</td>
<td>14</td>
<td>11</td>
<td>2</td>
<td>32</td>
<td>2</td>
<td>34</td>
</tr>
<tr>
<td>Azithromycin</td>
<td>13</td>
<td>26</td>
<td>3</td>
<td>5</td>
<td>47</td>
<td>13</td>
<td>60</td>
</tr>
<tr>
<td>Cephalosporins</td>
<td>20</td>
<td>12</td>
<td>16</td>
<td>6</td>
<td>54</td>
<td>10</td>
<td>64</td>
</tr>
<tr>
<td>Colistin sulphate</td>
<td>6</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>17</td>
<td>41</td>
<td>58</td>
</tr>
<tr>
<td>Cotrimaxazole</td>
<td>19</td>
<td>29</td>
<td>13</td>
<td>15</td>
<td>76</td>
<td>9</td>
<td>85</td>
</tr>
<tr>
<td>Levolin[levosalbutamol]</td>
<td>2</td>
<td>2</td>
<td>19</td>
<td>2</td>
<td>25</td>
<td>6</td>
<td>31</td>
</tr>
<tr>
<td>Chlorpheniramne +Codiene/Dextromethorphan</td>
<td>19</td>
<td>45</td>
<td>6</td>
<td>5</td>
<td>75</td>
<td>6</td>
<td>81</td>
</tr>
<tr>
<td>Xylometazoline</td>
<td>20</td>
<td>52</td>
<td>3</td>
<td>4</td>
<td>79</td>
<td>2</td>
<td>81</td>
</tr>
<tr>
<td>Phylepinephrine +Chloramphenaramine</td>
<td>26</td>
<td>34</td>
<td>6</td>
<td>4</td>
<td>70</td>
<td>9</td>
<td>79</td>
</tr>
<tr>
<td>Para+Phenylepinephrine +Chloramphenarin</td>
<td>98</td>
<td>164</td>
<td>14</td>
<td>25</td>
<td>301</td>
<td>21</td>
<td>322</td>
</tr>
<tr>
<td>Levocetirizine/Cetirizine</td>
<td>28</td>
<td>36</td>
<td>3</td>
<td>11</td>
<td>78</td>
<td>2</td>
<td>80</td>
</tr>
<tr>
<td>Paracetamol</td>
<td>56</td>
<td>64</td>
<td>28</td>
<td>8</td>
<td>156</td>
<td>45</td>
<td>201</td>
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<tr>
<td>Ondansetron</td>
<td>21</td>
<td>26</td>
<td>15</td>
<td>6</td>
<td>68</td>
<td>61</td>
<td>129</td>
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<tr>
<td>Albendazole</td>
<td>28</td>
<td>6</td>
<td>3</td>
<td>6</td>
<td>43</td>
<td>42</td>
<td>85</td>
</tr>
<tr>
<td>NaCl +Sodium Citrate Solution</td>
<td>61</td>
<td>76</td>
<td>12</td>
<td>9</td>
<td>158</td>
<td>9</td>
<td>167</td>
</tr>
<tr>
<td>Bacillus</td>
<td>30</td>
<td>75</td>
<td>16</td>
<td>17</td>
<td>138</td>
<td>28</td>
<td>166</td>
</tr>
</tbody>
</table>
DISCUSSION

The study was conducted to identify the paediatric population suffering with RTI and to analyse pharmacological management of RTI. Data obtained was classified according to age, disease and drug use. Among total patient population, the mean age group is found to be 4.06 years which may be due to increased susceptibility for seasonal changes and exposure of child to outside environment such as school, play grounds and more chances of spreading infections from other children. Similar findings are observed in a study conducted by pramil, et al.\textsuperscript{[7]} with the diagnosis of URTI under 6 years of age (80%) as these age groups were susceptible to URTI. In contrast to our study, Geetha S. Iyer\textsuperscript{[8]} found that majority of the patients were less than one year which may be due to increased susceptibility to infections during the weaning period.

Among total population, majority of children are diagnosed with AURTI (35%) followed by ARTI and ALRTI. The possible reasons could be seasonal changes (winter season) and URTI were more frequently observed than LRTI due to amount of exposure. In a study done by pramil et al. exclusively done on URTI observed that as winter has low humidity and increased dust potentially damage immune barriers, carry pathogens and increase the infection risk. Similar findings were observed by MF cotton et al.\textsuperscript{[9]} In contrast to our study findings, Iyer et al. study found that pneumonia (76.6%) is highly prevalent.

Antibiotics are primary choice of drugs for treating infections. Amoxicillin, Azithromycin, Clotrimazole are commonly prescribed antibiotics followed by cephalosporins in the conditions of relapse. The total antibiotic use in our study was 20%. Similarly 12% of antibiotic use was seen in Pramil et al. study. Whereas study done by Iyer et al. has shown that antibiotics were frequently prescribed as the children had severe infections/ illness. In our study and Pramil et al. infections were not severe and serious, partly due to OP setting and that is why symptomatic treatment was preferred.

Commonly prescribed antibiotics were Amoxicillin and Azithromycin. According to guidelines and literature,\textsuperscript{[7,8,10]} Pencillins are first choice of antibiotics followed by macrolides and cephalosporins. Amoxicillin is preferred antibiotic because of its spectrum of coverage,
first line of drug, low cost, availability of palatable dosage form and combination of dosage forms (Amoxicillin + Guaniphenersin + L – Salbutamol). Several studies\cite{7,8,11,12} have proven that Penicillins (amoxicillin) are primary choice of drugs in OP settings or primary care centres. Whereas, Cephalosporins, aminoglycosides, betalactums, fluoroquinololones and macrolides are indicated in seriously ill – patients and/or in IP cases for treating relapse. Pencillins were prescribed as first line of treatment and if infection is not subsided, superior doses of drugs such as cephalosporins, macrolides were used. This prescribing pattern in our study was in accordance with guidelines.

Geetha et al. study observed that older pencillins (ampicillin) were more frequently prescribed, which can be attributed in part to the variation in the local resistance pattern. Among the combinations Amoxicillin/ Clavulanic acid and cephalosporins have been frequently prescribed to cover wide spectrum of bacteria.

The other class of drugs prescribed were bronchodilators, nasal decongestants, antihistamines, antipyretics, anti – emetics, anti – protozoals and probiotics. Excessive and inappropriate use of antibiotics has been a major contributor to this ever growing problem. The majority of childhood URTI are caused by viruses which do not require antibiotics, hence symptomatic treatment is preferred over Prescribing antibiotics as observed in Meena et al.\cite{13} study.

Great deal of polypharmacy is observed in Iyer et al. and pramil et al. study with average number of drugs 3 – 3.3 per prescription which are similar to our study. Polypharmacy may be resultant of prescribers opting for symptomatic relief rather than directly choosing antibiotics. Our findings are similar to Pramil et al.

“As Prevention is better than Cure”, proper counselling and guidance has to be given to parents/ Care givers about maintaining hygiene and using home remedies to avoid children falling ill. At times home remedies and supplements can help the children recover faster even after falling ill. Apart from data collection we also participated in counselling parents and care givers regarding home remedies and necessary precautions to be taken to curb the illness and avoiding use of antibiotics and OTC drugs unless recommended by physician.
CONCLUSION
Our study found that URTI is commonly seen than other type of RTI. Symptomatic treatment is better to treat paediatric patients and antibiotics are preferred only in patients who are clinically identified as suffering with bacterial infections. Liquid dosage forms like syrups and elixirs are preferred because of acceptability and convenient dosage form to children. Personal hygiene of child is equally important to prevent the infections and seasonal infections which were more prevalent in our study. Along with the antibiotic use, standard guidelines should be prepared by hospital set up as paediatric patients are special population. Penicillin remains as a safe and effective antibiotic for treating respiratory tract infections in children. Counselling the parents and caregivers regarding importance of symptomatic relief drugs and under usage of antibiotics and taking necessary precautions to prevent seasonal infections will have major impact in decreasing infections in paediatric population.

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Conflict of Interest: We do not have any conflict of interest.

REFERENCES


