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Original Research Article

Drugs used in wheeze associated respiratory infection among children in tertiary care teaching hospital

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ABSTRACT

Background: This study was done to study the drugs used in wheeze associated lower respiratory infected paediatric patients in tertiary care teaching hospital.
Methods: Sample size was calculated as 78 and patients were selected based on the inclusion and exclusion criteria. The study was a prospective observational study and conducted in Department of Pediatrics, Rajah Muthiah Medical College and Hospital (RMMCH), Annamalai University.
Results: Our study shows that male children (63%) are affected with more than female children (37%). The most frequently prescribed drugs are antibiotics (96%), antipyretics (63%), expectorants and antitussives (54%) followed by beta adrenergic agonist (46%), beta adrenergic agonist with anticholinergic combination (14%) corticosteroids (18%). Our study also shows wheeze associated lower respiratory infection (WALRI) in children were significantly associated with bacterial infections (72%).
Conclusions: Our study concluded that antibiotics and antipyretics are the most commonly prescribed drugs for WALRI followed by expectorants and antitussives, beta adrenergic agonist, corticosteroids, beta adrenergic agonist with anticholinergic combination. Most of the treatment strategies are adopted from Standard Treatment Guidelines (STG) and World Health Organisation (WHO). The average number of prescribed drugs per encounter was more than that of WHO standards. The percentage of encounters in which an antibiotics and injections was higher than the ideal WHO standards it leads to anti-microbial resistance and costly forms of drug therapy.

Keywords: Antibiotics, Antipyretics, Cost analysis, Prescription pattern, STG, WALRI, WHO

INTRODUCTION

Wheeze associated with respiratory tract infection is a common problem in children less than two years of age with reported attack rates in the western literature being as high as 11.4 per 100 children in the second year life.[1,2] Wheezing in children, particularly in infancy, does not mean that chronic asthma will develop later in life. At least 20% of the children less than 2 years of age experience transient episodes of wheezing during viral infections. As these infants grow, this relationship becomes normal, and it is thought that these are the children who come out asthma. However, at least 15% of the children who have wheeze during infancy continue to wheeze beyond 6 years of age. Finally, at least 15% of children develop late-onset wheezing patterns characterized by the initial development of symptoms beyond 6 years of age.[3,4] Infants with first episode of wheeze, who usually have viral bronchiolitis, also do not need antibiotics through the response to initial bronchodilators may not be consistency seen in such a case. The treatment of children with wheeze thus needs to

be based on the clinical evaluation of the patient as well as response to inhaled bronchodilator as per initial algorithm. The following drugs used to treat wheeze associated lower respiratory infections. They are bronchodilators, corticosteroids, antibiotics. Selection of antibiotic is dictated by the age of the child, causative factors and sometimes the results of chest radiology. Nasal block to be treated with saline nasal drops as and when required, especially before feeds. Fever to be treated as in section on fever.[5]

Prescription pattern monitoring studies are drug utilization studies with main focus on the rational use of drugs in populations. The definition of rational use of medicines- "Patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period and at the lowest cost to them and their community".[6,7]

Cost of illness (COI) is defined as the value of the resources that are expended or forgone as a result of health sector costs the value of decreased (direct costs) or lost productivity by the patient (indirect costs) and the cost of the pain and suffering (intangible costs).[8]

Objectives

To study the drugs prescribed in WALRI; to study the treatment pattern between STG and evidence- based medicine; to evaluate lower respiratory infection associated with virus or bacteria among children increases risk of wheezing in childhood; and to study the cost of drugs used in treatment of WALRI.

METHODS

Study method was prospective observational study. Study site was Department of Pediatrics, RMMCH, Annamalai University. Study period and duration was November 2018 to April 2019, 6 months.

Sample size calculation

$$n = \frac{z^2 \times p(1-P)}{d^2}$$

Based on the above formula sample size was calculated as 78.

Inclusion criteria

In-patient diagnosed of WALRI; patient of both genders; patients up to 12 years of age; patient prescribed with antimicrobial agents; received therapy with inhaled corticosteroids and bronchodilators.

Exclusion criteria

Patient with upper respiratory infections; patient with Coronary Heart Diseases (CHD); history of seizure or other neurological disorders; born at less the 36 weeks of gestation; mentally ill patients; and patient's currently undergoing assisted ventilation.

Based on the selection criteria patients would be selected and enrolled. Prior to start the study patient inform consent form would be obtained. A patient data collection form used to collect the details like in-patient number, age, gender, date of admission and discharge, chief complaints, past history, history of present illness, family history, vitals, respiratory system examination, laboratory investigation, diagnosis and therapeutic management, drug name, category, brand name, frequency, strength and route of administration. The collected data was analysed for number of antibiotics per prescription, number of expectorants and antitussives, number of corticosteroids per prescription, number of beta-adrenergic agonists per prescription and other categories of drugs per prescription. The rationality of drugs usage would be assessed and analysed by interpreting the collected data with WHO prescribing indicators.[14] The cost analysis of drugs would be done by calculating cost difference between the prescribed brand and its cost with available cheaper brand and its cost.[15]

World Health Organisation (WHO) prescribing indicators

Average number of drugs per encounter; percentage of drugs prescribed by generic name; percentage of encounters with an antibiotic prescribed; percentage of encounters with an injection prescribed; and percentage of drugs prescribed from essential drug list or formulary

From the above WHO indicators prescription was analysed.[14]

Cost analysis of the drugs

Comparing two or more medicine of equal therapeutic effectiveness and safety to find out which one is the cheapest. It can be used to compare different brand of same drug. Price of most expensive brand- price of least expensive brand/price of least expensive brand × 100.

From the above formula, saving cost of the drug was calculated.[15]

Statistical analysis

Data was analysed by using Microsoft excel 2007. Descriptive statistics were used to analyse the results. Percentage and averages of the variable were also calculated to compare the data with other findings.

RESULTS

By applying inclusion and exclusion criteria a total of 78 samples were enrolled into the study. The patients are divided into four age trends. The age wise distribution of

study showing that the maximum number of patients being in 0-12 months accounting 45% of the total followed by 3-6 years accounting 27%, 1-3 years accounting 19% and 6-12 years accounting 9% (Table 1).

Table 1: Age wise distribution.

Age	Number of patients	Percentage of patients (%)
0-12 months	35	45
1-3 years	15	19
3-6 years	21	27
6-12 years	7	9

The total number of male and female patients in the study are males accounting 63% and females accounting 37% (Table 2).

Table 2: Gender wise distribution.

Gender	Number of patients	Percentage of patients (%)
Female	29	37
Male	49	63

The most common clinical symptoms in the studied cases was cough 96%, cold 88%, fever 65%, running nose 19% and difficulty in breathing 13% (Figure 1).

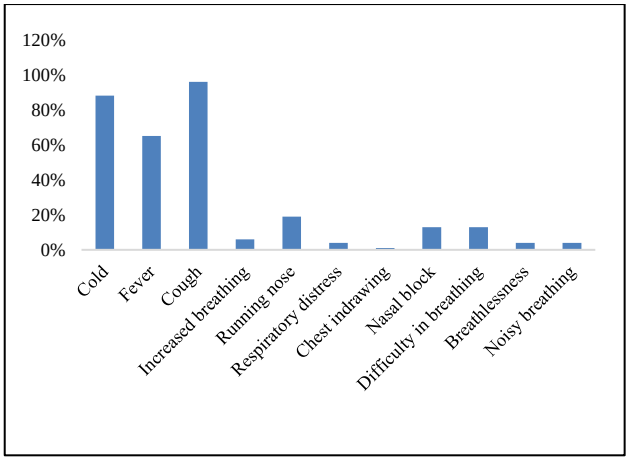

Figure 1: Distribution of clinical manifestations.

The most frequently prescribed antibiotics are cephalosporin 38% followed by aminoglycosides 23%, penicillin derivatives 22%, and macrolides 13%. The most frequently prescribed corticosteroids are budesonide 10% followed by prednisolone 5%, hydrocortisone 3%. The most frequently prescribed expectorants and antitussives are ambroxol 21% followed by ambroxol + guaifenesin + levosalbutamol combination 19%, chlorpheniramine + dextromethorphan combination 14%. The most frequently prescribed antipyretics are paracetamol 63% (Table 3).

Table 3: Distribution of drugs prescribed for WALRI.

Drugs	Classification	Number of patients	Percentage of patients (%)
Cephalosporin	Antibiotic	30	38
Penicillin derivatives	Antibiotic	17	22
Aminoglycosides	Antibiotic	18	23
Macrolides	Antibiotic	10	13
Budesonide	Corticosteroids	8	10
Prednisolone	Corticosteroids	4	5
Hydrocortisone	Corticosteroids	2	3
Ambroxol	Expectorants and antitussives	17	22
Ambroxol + guaifenesin + levosalbutamol	Expectorants and antitussives	15	19
Chlorpheniramine + dextromethorphan	Expectorants and antitussives	11	14
Paracetamol	Antipyretics	49	63
Levosalbutamol	Beta adrenergic agonist	36	46
Levosalbutamol + ipratropium bromide	Beta adrenergic agonist + anticholinergic	11	14

Table 4: Distribution of drugs belonging to EDL and STG.

Drugs	Number of patients	Percentage of patients (%)
EDL	72	92%
STG	74	95%

Table 5: Distribution of WALRI associated with bacteria and virus.

Causative agents	Number of patients	Percentage of patients (%)
Bacteria	56	72%
Virus	23	29%

Table 6: WHO prescribing indicators.

Indicators	Findings	Standards
Average number of drugs per prescription	3.8	1.6-1.8
Percentage of drugs prescribed by generic name	28	100.0
Percentage of encounters with an antibiotic prescribed	96	20.0-26.8
Percentage of encounters with an injection prescribed	92	13.4%-24.1%
Prescribed drugs from EDL	92	100.0

Distribution of drugs belonging to essential drug list (EDL) is 92% and standard treatment guidelines (STG) is 95% (Table 4).

Our study shows that WALRI associated with bacterial infections 72% more than viral infections 29% (Table 5).

According to WHO prescribing indicators the average number of drugs per encounter or mean was 3.8. The percentage of drugs prescribed by generic name was 28%. The percentage of encounters with an antibiotic prescribed was 96%. The percentage of encounters with an injection prescribed was 92% (Table 6).

Table 7: Cost analysis of drugs.

Drug	High cost (Rs)	Low cost (Rs)	Cost difference (Rs)	Saving cost (%)
Cefotaxime 250 mg	16.80	14.06	2.74	19.48%
Cefotaxime 500 mg	20.60	18.00	2.6	14.44%
Ceftriaxone 500 mg	33.00	32.00	1.00	5.1%
Ceftriaxone 250 mg	19.00	16.00	5.00	18.75%
Amikacin 100 mg	20.00	16.00	4.00	25.0%
Amikacin 250 mg	32.00	29.50	2.70	9.21%
Ampicillin 250 mg	18.50	13.74	4.76	34.64%
Ampicillin 500 mg	25.00	18.33	4.67	25.47%
Azithromycin 100 mg	29.97	24.41	5.56	22.77%
Azithromycin 200 mg	48.41	44.89	3.52	7.841%
Vancomycin 500 mg	295.0	264.0	31.0	11.74%
Ambroxol + levosalbutamol + guaifenesin	94.50	80.00	14.5	18.12%
Chlorpheniramine + dextromethorphan	80.00	55.00	25.0	45.4%
Budesonide	275.52	266.56	8.96	22.11%
Levosalbutamol 0.5 mg respules	22.5	6.00	16.3	27.1%
Levosalbutamol 50 µg + ipratropium bromide 20 µg	58.2	11.9	46.3	52.7%
Prednisolone	10.89	5.91	4.98	67.6%
Amoxicillin + clavulanic acid	133.19	129.04	4.15	3.21%
Paracetamol 125 mg	33.0	21.08	11.92	56.54%
Ambroxol 7.5 mg	25.8	22.00	3.80	17.27%

Table 8: Cost of Illness of drugs.

Drugs	Acquisition costs (Rs)	Doses/ day	Costs/ day (Rs)	Laboratory costs (Rs)	Total medicines costs/day (Rs)
Cefotaxime	16.80	2	33.6	49.52	83.12
Vancomycin	295	1	295	49.52	344.52
Levosalbutamol	22.5	2	44.6	49.52	94.52
Ipratropium bromide + levosalbutamol	58.2	2	116.4	49.52	165.92
Ambroxol	25.8	2	51.6	49.52	101.12
Ambroxol + levosalbutamol + guaifenesin	94.50	2	189	49.52	238.52
Budesonide	275.52	2	551.04	49.52	600.56
Prednisolone	10.89	2	21.78	49.52	71.3

Table provides cost of drugs including antibiotics, corticosteroids, expectorants and antitussives, beta adrenergic agonist, beta adrenergic agonist with anticholinergic combination, antipyretics (Table 7).

Based on the COI the cheapest antibiotics are cefotaxime and the most expensive antibiotics are vancomycin. The cheapest beta-adrenergic agonists are levosalbutamol and most expensive combination are ipratropium bromide + levosalbutamol. The cheapest expectorants and antitussives are ambroxol and the most expensive expectorants and antitussives are ambroxol + levosalbutamol + guaifenesin combination. The cheapest corticosteroids are prednisolone and the most expensive corticosteroids are budesonide (Table 8).

DISCUSSION

In this study patients were divided into four age groups and patients of 0-12 month and 3-6 years of age group were having high frequency of WALRI while other study concluded that higher numbers of WALRI were seen between age group 13-24 months.[4]

Male children (63%) were more affected with WALRI than female children (37%) and also similar study showed results of male children (58.6%) were found to be more than the female children (41.4%).[9]

The most common clinical symptom in the studied cases were cough and cold in patients followed by fever, running nose, difficulty in breathing while other study concluded that fever with respiratory distress was indicative of WALRI.[4]

The distribution of WALRI associated with bacterial infections (72%) and virus infections (29%) while other study shows 54.7% of WALRI in the rainy season caused by RSV (respiratory syncytial virus).[10]

The most commonly prescribed drugs in WALRI are antibiotics (96%), antipyretics (63%), expectorants and antitussive (54%) followed by beta adrenergic agonist (46%), beta adrenergic agonist with anticholinergic (14%) corticosteroids (18%) while another study shows antibiotics (33%), antipyretics (32%), and β_2 agonists (32%) were most common drugs used to treat RTI (Respiratory Tract Infections).[11]

Levosalbutamol (46%) was the commonly prescribed bronchodilator in WALRI while another study shows in WALRI the most prescription was for salbutamol (40.4%) alone.[9]

Expectorants and antitussives were one of the drugs commonly prescribed in WALRI (55.12%) also similar study shows the use of mucolytics (55.6%) and other concurrent prescriptions were with expectorants (48.9%).[9]

According to WHO prescribing indicators, this study shows the average number of drugs per encounter or mean was 3.8 and other study average number of drugs per encounter or mean was 4.39. The percentage of drugs prescribed by generic name in this study was 28% and this value is less compared to other study shows 56.12% of drugs was prescribed by generic name. The percentage of encounters with antibiotic prescribed was 96% and other study value higher than this study and it shows 98.29% of antibiotic prescribed. The percentage of encounters with an injection prescribed was 92% these are higher than the ideal WHO standards while another study was within the WHO standard and the injection prescribed percentage was 23.20%. The percentage of drugs prescribed from EDL was 92% while another study was less than the WHO standards and it shows 38% drugs only prescribed from EDL.[11]

Antimicrobial resistance (AMR) threatens the effective prevention and treatment of an ever-increasing range of infections caused by bacteria, parasites, viruses and fungi. As a result, the medicine become ineffective and infections persist in the body, increasing the risk of spread to others.[12]

Antibiotic irrational use leads to antibiotic resistance and it leads to higher medical costs, prolonged hospital stays, and increased mortality. The world urgently needs to change the way it prescribed and uses antibiotics. Even if new medicines are developed, without behaviour change, antibiotic resistance will remain a major threat. Behaviour changes must also include actions to reduce the spread of infections through vaccination, hand washing and good food hygiene.[13]

CONCLUSION

Our study concluded that antibiotics and antipyretics are the most commonly prescribed drugs for WALRI followed by expectorants and antitussives, beta adrenergic agonist, corticosteroids, beta adrenergic agonist with anticholinergic combination. Episodes of wheezing, difficulty in breathing, cough which respond treatment with corticosteroids, beta adrenergic agonist in patients with WALRI.

Most of the treatment strategies are adopted from Standard Treatment Guidelines (STG) and World Health Organisation (WHO). The average number of prescribed drugs per encounter was more than that of WHO standards. The percentage of encounters in which an antibiotics and injections was higher than the ideal WHO standards it leads to anti-microbial resistance and costly forms of drug therapy.

Based on the COI and it was found that patient paying more costs for corticosteroids in the form of nebulizers followed by expectorants and antitussives, beta adrenergic agonist and antibiotics.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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