The Professional Medical Journal
www.theprofesional.com

DOI: 10.29309/TPMJ/2019.26.05.3464

ORIGINAL PROF-0-3464

BACTERIAL PNEUMONIA;

CORRELATION BETWEEN LABORATORY MARKERS (C REACTIVE PROTEIN, WHITE BLOOD CELLS) AND TREATMENT FAILURE WITH ORAL AMOXICILLIN IN BACTERIAL PNEUMONIA IN CHILDREN.

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Article received on:
13/07/2017
Accepted for publication:
15/06/2018
Received after proof reading:
18/04/2019

ABSTRACT… Objectives: To assess the correlation between laboratory markers (C Reactive Protein, White Blood Cells) and treatment failure with Oral Amoxicillin in Bacterial Pneumonia in children aged 2-59 months old at Pediatrics Emergency Department LUMHS Hyderabad. **Study Design:** Cross sectional study. **Setting:** Department of Pediatric Emergency LUMHS, Civil Hospital Hyderabad. **Period:** November 2015 to May 2016. **Methodology:** A total of 80 children aged 2-59 months old were treated with Oral Amoxicillin 90mg/kg/day for 5 days and response to treatment was assessed on 3rd day of admission. Blood was drawn from the veins over the dorsum of either hand at initial visit for C Reactive Protein and WBC Count. Children who do not improve on 3rd day of admission were declared treatment failure and switched to 2nd line treatment that is Injection Ceftriaxone. **Results:** In this study overall 78.7% children improved with Oral Amoxicillin 90mg/kg/day BD for 5 days, while 16.3% children had treatment failure on Oral Amoxicillin. 5% children were defaulted due to parents concerns. **Conclusion:** C Reactive Protein is a valuable marker that can predict the response of Oral Antibiotics in bacterial Pneumonia in children. Cost effectiveness can be determined by further studies, hence to justify that which children with Bacterial Pneumonia should be treated with 2nd line Injectable antibiotics from very beginning of treatment.

Key words: Amoxicillin, Children, CRP, Bacterial Pneumonia, WBC.

Article Citation: Chohan MN, Shaikh S, Shaikh S, Memon Z, Memon Y. Bacterial pneumonia; correlation between laboratory markers (c reactive protein, white blood cells) and treatment failure with oral amoxicillin in bacterial pneumonia in children. Professional Med J 2019; 26(5):730-733.
DOI: 10.29309/TPMJ/2019.26.05.3464

INTRODUCTION

Pneumonia causes 16% of all deaths of children under 5 years old, it killed 920 136 children in 2015. Bacterial Pneumonia can be treated with antibiotics, but only 35% of children receive the antibiotics they need.[1] Pakistan still stands in the top five countries in which childhood pneumonia is very common. About 92,000 children die due to pneumonia in Pakistan every year.[2]

In developing countries the incidence of pneumonia in children below 5 years is about 0.29 episodes per child per year, it is equal to 151.8 million new cases every year and 13.1 million of them get hospitalization due to its severity. In developed countries 4 million cases of pneumonia occurs every year worldwide. 43 million children in India, 21 million children in China and 10 million children in Pakistan, Bangladesh, Indonesia and Nigeria (6 million each) cases of Pneumonia occurs each year that is the 44% of cases all over the world.[3]

According to World Health Organization Pneumonia is defined as, having cough along with fast breathing. Fast breathing is defined as a respiratory rate ≥40 breaths/min in 1-5 year age group and ≥50 breaths/min in 2-12 months age group. According to severity of Pneumonia, it is categorized in 2 types; "pneumonia" with fast breathing and/or chest indrawing, and "severe pneumonia", pneumonia with any general danger sign.[4]

According to WHO Guidelines bacterial pneumonia should be treated with Oral Antibiotics, except when the patient cannot tolerate oral therapy or has severe Pneumonia.[5] Amoxicillin is

the drug of choice for children 2-59 months of age because it is active against S. pneumoniae that is the most common cause of bacterial pneumonia in children less than 5 years old.

Erythrocyte sedimentation rate and C-reactive protein concentration cannot differentiate between viral and bacterial causes of Community acquired Pneumonia but it may provide useful information about the response of treatment.[6]

As there is no specific laboratory test that can predict the response of oral antibiotics at the time of initial visit, we just follow the protocols of our institutions, that is start with the Oral Antibiotics and then watch the response of Oral Antibiotics for 3-5 days.

If the child does not response on Oral Antibiotics then we switch to Injectable 2nd Line Antibiotics. This causes the delay in proper treatment, the child suffers more and the family suffers a lot. In this study we want to see whether white blood cell count and C Reactive Protein at the time of intial visit can predict the response to Oral Antibiotics.

We also want to search that, whether High C Reactive Protein and High WBC Count is associated with treatment failure with Oral Antibiotics, if this is true then we can start 2nd Line Injectable Antibiotics at the time of Initial Visit among those who present with Pneumonia and above laboratory findings, hence to decrease the disease duration and suffering of Child and family.

METHODOLOGY

It was cross sectional study, carried out at the Pediatric department LUMHS, Hyderabad on 80 patients of Pneumonia from November 2015 to May 2016. Consent was taken from the parents of Children and permission was taken from Ethical Committee.

80 patients were dealt by non-probability, consecutive technique. Data was entered and analyzed in SPSS version 22.0. Mean and standard deviation was calculated for numerical variables like age. Frequency and percentage was calculated for Laboratory Findings and Outcome.

Inclusion Criteria

Children of either gender aged 2 months to 59 months who presented with Cough, Fever and difficulty in breathing (Fast Breathing and Subcostal Recessions) were included in the study.

Exclusion Criteria

Children having the sign of upper respiratory tract infections (Runny nose, red eyes, ear discharge and sneezing), were excluded from the study. Children having Cyanosis, Seizures, and Unable to feed or vomiting everything were also excluded from the study.

After detailed Physical Examination, C Reactive Protein and Complete Blood Count was taken at the time of arrival at Emergency Department. After that Children were admitted in Pediatric ward for the administration of Oral Amoxicillin (90mg/kg/day, BID), to confirm the compliance and to see the response of treatment.

Children were examined every 24 hourly for the presence of fever, fast breathing and chest in drawing. Those who were afebrile and having no fast breathing or chest indrawing on 3rd day of admission were discharged on Oral Amoxicillin to complete the 5 days of antibiotics at home and reassessed at Out Door Department. Those who were febrile and/or fast breathing, chest indrawing on 3rd day or oral antibiotics were switched to Inj Ceftriaxone as a Second Line Antibiotic. Those who left the hospital before the 3rd day of admission or who insisted for early Injectable antibiotics were considered as defaulters.

Fast Breathing: Age 2 – 12 months (Respiratory Rate 50 or above per minute), Age > 12 – 59 months (Respiratory Rate 40 or above per minute). The outcomes measures were 1) Improved: No fever and no fast breathing or chest indrawing on 3rd day of admission, 2) Treatment Failure: Fever or fast breathing, chest indrawing persisting at 3rd day of admission, 3) Defaulters: Insisted to start injectable 2nd line antibiotics within 3 days of admission or who left the hospital before 3rd day of admission.

RESULTS

There were total 80 children, 73.8% children were between 2-12 months old age group, while 26.2% children were among >12-59 months old age group. 62.7% children were male and 37.3% children were female among 2-12 months old age group, while 71.4% were male and 28.6% were female among >2-59 months old age group. Treatment failure was 15.3% among 2-12 months old age group, while 19% among >2-59 months old age group.

WBC Count was >15000 among 33% children, while C Reactive Protein was positive in 61% children. Treatment failure was present in 32.4% cases with Positive C Reactive Protein, while 20% of cases with WBC Count >15000 had treatment failure.

In this study overall 78.7% children improved with Oral Amoxicillin 90mg/kg/day BD for 5 days, while 16.3% children had treatment failure on Oral Amoxicillin. 5% children were defaulted due to parents concerns.

DISCUSSION

Initial C Reactive Protein level at the time of initial visit and then Serial measurement of CRP is of great value in monitoring the response of antibiotic therapy, it can also help to determine when to stop antibiotics that are stopped upon normalization of CRP value.[7]

If the antibiotics are not working well and the clinical condition is not improving then CRP levels will be persistently high. CRP concentration monitoring can predict the outcome earlier than clinical signs.[8]

CRP is more specific and sensitive as compared to WBC Count for the differentiation of bacterial and viral infections.[9]

As compared to CRP, WBC values are not used in the monitoring of antibiotic treatment in bacterial infections.[9]

Our study shows strong correlation of Positive C Reactive Protein with treatment failure with oral Amoxicillin in children treated in Pediatric Department LUMHS, Hyderabad. High WBC Count was not as significant as Positive CRP in treatment failure detection.

Our study shows treatment failure in 16.3% children treated with Oral Amoxicillin 90mg/kg/day BD for 3 days, while 78.7% children improved with Oral Amoxicillin. Treatment failure was more common (32.4%) in children whose initial C Reactive Protein was positive, while it was less common (20%) in children whose WBC Count was >15000. There is a little bit age difference in treatment failure groups, it is 15.3% in 2-12 months old age group, while it is 19.1% in >12-59 months old age group.

Age Group	Male	Female	Total (%)	Treatment Failure	Mean (SD)	P-Value
2 m- 12m	37(62.7%)	22(37.3%)	59 (73.8%)	9(15.3%)	6.525(3.213)	<0.01
>12 - 59m	15 (71.4%)	6 (28.6%)	21 (26.2%)	4(19.1%)	26.761(9.894)	<0.01

Table-I. Age groups and gender

Laboratory Findings	Yes	Treatment Failure	Mean (SD)	P-Value
WBC (>15000)	26(33%)	4(20%)	0.900 (0.3018)	<0.01
Positive CRP	49(61%)	12(32.4%)	0.6125(0.4902)	<0.01

Table-II. Laboratory markers

Outcome	Frequency	%	P-Value
Improved	63	78.7	<0.002
Treatment Failure	13	16.3	<0.002
Default	4	5	<0.002

Table-III. Outcome

Although this study was done in limited period of time and sample size was not high, we need more such studies in future over broader population, to determine the correlation of C Reactive Protein with treatment failure in bacterial pneumonia, treated with Oral Amoxicillin.

Literature review shows that, no such study done before in Pakistan and else in the world, that correlate the Positive CRP with oral Amoxicillin response in pediatric Pneumonia, hence it is advised that consideration should be given to this as Injectable Antibiotics might be started earlier in selected cases.

CONCLUSION

C Reactive Protein is a valuable marker that can predict the response of Oral Antibiotics in bacterial Pneumonia in children. Cost effectiveness can be determined by further studies, hence to justify that which children with Bacterial Pneumonia should be treated with 2nd line Injectable antibiotics from very beginning of treatment.

Although this study shows the strong correlation Of Positive C Reactive Protein with Treatment failure with Oral Antibiotics, but this was done on limited children. So we need more studies to cover more population to validate it.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Salma Shaikh	Critical analysis.	
3	Saleem Shaikh	Drafting.	
4	Zubair Memon	Data collection.	
5	Yasmin Memon	Result analysis.	