

Efficacy of Vitamin C in Reducing Duration of Hospital Stay in Children Having Pneumonia

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ABSTRACT

Background: Pneumonia, a disease ensuing in inflammation of parenchyma of lungs. Variety of organisms became a reason for this disease including bacteria, viruses, fungi, or parasites. An important antioxidant, Vitamin C, acts as a reducing agent for the purpose of reversal of oxidation in liquids. Beneficial effects in parallel with respiratory tract infections (RTIs) are ensued by antioxidant properties of vitamin C. In RTIs, massive amount of oxidizing compounds are released by neutrophils being toxic to other cells. A proficient consumption of extracellular vitamin C resulted by Activation of neutrophils, advocates that massive concentration of vitamin C may act as a shield against the detrimental effects of oxidants release and reduce the duration of hospital stay in patients having pneumonia.

Methodology: After taking approval from hospital ethical committee, parents/care takers being cognizant give a consent in black and white, after explaining the importance of the study. A randomized lottery technique was used while admitting Children admitted with pneumonia. Vitamin C group or placebo group, I monitored the administration of placebo to patients (being 2ml of normal saline) and vitamin C. Cephalosporin-3rd generation- i.e. Ceftriaxone (75mg/kg/day in 2 divided doses) helps in the standardization of the rest of the treatment. The numeral count of days required by severe pneumonia to improve was duly noted. All charges of treatment was borne by the hospital and not by the patient. A Performa designed to get all the relevant information was used for collection of data. Confounding variables identified and excluded through exclusion criteria.

Results: In our research, average age was evaluated as 2.85±1.36 years in Vitamin C and 2.94±1.36 years in placebo group, 52.5%(np=42) in Vitamin C and in Placebo group, 48.75%(np=39) were male while in Vitamin C they were 47.5%(np=38) and 51.25%(np=41) in placebo group were females, comparison of mean length of hospital stay in children 2 months upto 5 years with pneumonia by giving vitamin c and placebo in parallel to adjuvant antibiotic treatment shows 6.98±0.91 days in Vitamin C and 7.74±1.34 days in placebo group, value of p was 0.001 showing a marked difference.

Conclusion: We determined that the average length of hospital stay in children 2 months upto 5 years with pneumonia by giving Vitamin C is significantly shorter when compared to placebo in addition to adjuvant antibiotic treatment.

Keywords: Children, pneumonia, management, vitamin C, length of hospital stay

INTRODUCTION

Pneumonia being the major (18%) single root cause of death in children under the age of 5 years. Universally yearly incidence of the disease in children aged <5-years bounds upto 120 to 160 million episodes, with most of them occurring in under resourced countries(99%).¹ In the south East Asian Region the projected incidence of viral disease in children<5 years is 0.36 episodes per child per year while in contrast with it in developed countries the rate is 0.05 episodes per child per year.² pneumonia is the 2nd most known basic cause of death under 5 mortality after neonatal deaths incrementing for 19% of deaths and 95% of all novel disease cases in children happen in emerging countries with highest number in China, Pakistan and Bangladesh led by India. Pakistan -4th largest contributor - incorporating 7 million cases per year out of which over 92,000 children face death in children with age < 5, According to UNICEF and WHO.³

Aspects linked with pneumonia include young age, scarcity of wealth, poor vaccination status, indoor air

contamination, and overpopulation and famine/poor nutritional practices.¹

Vitamin C is an important antioxidant on aqueous milieu of body⁴ and its effects may be most pronounced under conditions when oxidative stress is increased. Viral and bacterial infections (cause of pneumonia) lead to the activation of leukocytes.³ An important part of host distinctive inborn immune response to extraneous pathogens is Oxidative stress⁵. Oxidative stress in the respiratory system increases the production of mediators of pulmonary inflammation. vitamin C being Antioxidant have been demonstrated to be efficacious in preventing lung injury.⁶

Data Collection: After taking approval from hospital ethical committee, parents/care takers being cognizant give a consent in black and white, after explaining the importance of the study. Patient profile including name, age, sex, address, hospital number, serial number, date of inclusion in study was noted. Data was collected from the patients

charts and/or by direct interview of the child's guardian. A randomized lottery technique was used while admitting Children admitted with pneumonia. Vitamin C group or placebo group, being administered by the management of placebo to the patients and vitamin C. 50 mg per day is the Daily permanence of Vitamin C recommended in newborns and 25 mg per day in children encroaching 5 years of age. Staff nurse given 200 mg vitamin C to the patients in once daily dose in form of cecon syrup. Placebo syrup was 2ml of normal saline, Rest of the treatment was standardized with injection 3rd generation cephalosporin i.e. Ceftriaxone. Three times daily patient's clinical progress was taken regarding pulse rate, temperature, respiratory rate, chest in drawing and oxygen saturation. The numeral count of days required by severe pneumonia to improve was duly noted. A performa designed to get all the pertinent information was used for data collection.

Data Analysis: The entry and evaluation of data is done by statistical software SPSS version 20. For qualitative data like gender & malnutrition, percentages and frequencies were given and quantitative data like age, length of hospital stay were described as mean±S.D. For comparison of length of hospital stay in both groups Independent sample t-test was relied. Value of p less than 0.05 was deliberated as noteworthy. Results were described and also presented in the form of tables and graphs accordingly. Data was stratified for age, gender, undernourishment to handle the effect modifiers. After stratification, independent sample t-test was taken into account taking Value of $p \leq 0.05$ as substantial.

RESULTS

A total number of 160 cases, (80 in each assemblage) satisfying the inclusion/exclusion standards were enrolled to contrast the average length of hospital stay in children 2 months upto 5 years with pneumonia by giving Vitamin C and placebo in addition to adjuvant antibiotic treatment.

Age distribution of the patients was done, it shows that 70%(np=56) in Vitamin C Group and 65%(np=52) in Placebo Group were between 2months to 3 years of age while 30%(np=24) in Vitamin C Group and 35%(np=28) were between 4-5 years of age, mean±sd was calculated as 2.85±1.36 years in Vitamin C and 2.94±1.36 years in placebo group. (Table No. 1)

Gender distribution shows that 52.5%(np=42) in Vitamin C and 48.75%(np=39) in Placebo group were male while 47.5%(np=38) in Vitamin C and 51.25%(np=41) in placebo group were females. (Table No. 2)

Comparison of mean length of hospital stay in children 2 months upto 5 years with pneumonia by giving vitamin c and placebo in addition to adjuvant antibiotic treatment shows 6.98±0.91 days in Vitamin C and 7.74±1.34 days in placebo group, value of p was 0.001 showing a significant difference. (Table No. 3)

Nutritional status shows that 63.75%(np=51) in Vitamin C and 68.75%(np=55) in placebo group were malnourished while 36.25%(np=29) in Vitamin C and 31.25%(np=25) in placebo group were females.

The data was stratified for age, gender, malnutrition to deal with effect modifiers. Post-stratification, independent sample t-test was applied taking Value of $p \leq 0.05$ as significant.

Table 1: Age distribution (np=160)

| Age (in years) | Vitamin C Group (np=80) | | Placebo Group (np=80) | |
|----------------|-------------------------|-----|-----------------------|-----|
| | No. of patients | % | No. of patients | % |
| 2m-3 years | 56 | 70 | 52 | 65 |
| 4-5 years | 24 | 30 | 28 | 35 |
| Total | 80 | 100 | 80 | 100 |
| Mean±SD | 2.85±1.36 | | 2.94±1.36 | |

Table 2: Gender distribution (np=160)

| Gender | Vitamin C Group (np=80) | | Placebo Group (np=80) | |
|--------|-------------------------|------|-----------------------|-------|
| | No. of patients | % | No. of patients | % |
| Male | 42 | 52.5 | 39 | 48.75 |
| Female | 38 | 47.5 | 41 | 51.25 |
| Total | 80 | 100 | 80 | 100 |

Table 3: Comparison of mean length of hospital stay in children 2 months upto 5 years with pneumonia by giving vitamin c and placebo in addition to adjuvant antibiotic treatment (np=160)

| Length of hospital stay | Vitamin C Group (np=80) | | Placebo Group (np=80) | |
|-------------------------|-------------------------|------|-----------------------|------|
| | Mean | SD | Mean | SD |
| | 6.98 | 0.91 | 7.74 | 1.34 |

DISCUSSION

Pneumonia, a disease ensuing in inflammation of parenchyma of lungs. Variety of organisms became a reason for this disease including bacteria, viruses, fungi, or parasites. Pneumonia is the 2nd most known basic cause of death under 5 mortality after neonatal deaths incrementing for 19% of deaths and 95% of all novel disease cases in children happen in emerging countries with highest number in China, Pakistan and Bangladesh led by India. Pakistan -4th largest contributor - incorporating 7 million cases per year out of which over 92,000 children face death in children with age < 5.⁹

Vitamin C, an important antioxidant, acts to reverse oxidation in liquids due to its reducing agent characteristics. Free radicals being more than antioxidants in the human body leads to the condition called oxidative stress and has an influence on cardiovascular ailment, hypertension, dangerous inflammatory illnesses, and diabetes as well as on poorly ill patients and folks with critical burns. Advantageous effects in parallel with respiratory tract infections (RTIs) are ensued by antioxidant properties of vitamin C. In RTIs, massive amount of oxidizing compounds are released by neutrophils being toxic to other cells. A proficient consumption of extracellular vitamin C resulted by Activation of neutrophils, advocates that massive concentration of vitamin C may act as a shield against the detrimental effects of oxidants release.¹²

This study was directed to show the advantageous effect of vitamin C in reducing morbidity and period of average length of stay of patients having pneumonia. The result may help in recommending its use in children with pneumonia and reducing hospital burden.

In our study, mean age was calculated as 2.85±1.36 years in Vitamin C and 2.94±1.36 years in placebo group, 52.5%(np=42) in Vitamin C and 48.75%(np=39) in Placebo group were male while 47.5%(np=38) in Vitamin C and 51.25%(np=41) in placebo group were females, comparison of mean length of hospital stay in children 2 months upto 5 years with pneumonia by giving vitamin c

and placebo in addition to adjuvant antibiotic treatment shows 6.98±0.91 days in Vitamin C and 7.74±1.34 days in placebo group, value of p was 0.001 showing a marked deviation.

We compare the results of a study conducted in South Africa Showed that short term micronutrient supplementation reduced the duration of hospital stay by 1.9 d (20%) in children with pneumonia. The hospital stay in placebo group was 9.4±4.9 and 7.5±3.5 (p<0.05) in supplement group.⁷

Total no. of days (mean ± SD) of acute respiratory tract infections were 2.1±2.9 in vitamin C group in contrast to 5.4±4.4 in placebo group In a study conducted in Israel.¹³ The results being analogous to our study showed much better progress in contrast to present-day study and that accomplished in Rangpur, Bangladesh. A study directed in Soviet Union on adults suffering found a dose reliant decline in time of recovery with 2 doses of vitamin C.¹⁴ In study accomplished in United Kingdom on elderly patients suffering, low death rate and good development in the vitamin C group was distinguished in contrast to those in placebo group.¹⁵

CONCLUSION

We concluded that the mean length of hospital stay in children 2 months upto 5 years with pneumonia by giving Vitamin C is significantly shorter when compared to placebo in addition to adjuvant antibiotic treatment

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