

A study of effect of zinc on hospital stay in children of age 3 to 36 months admitted with pneumonia

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Abstract

Introduction: Pneumonia is an inflammatory condition of the lung. It is often characterized as including inflammation of the parenchyma of the lung (that is, the alveoli) and abnormal alveolar filling with fluid (consolidation and exudation).

Aims and objectives: To study the effect of zinc on hospital stay in children of age 3 to 36 months admitted with pneumonia. **Material and Method:** The present study was conducted in the department of pediatrics of MIMSR medical college and Yashvantrao Chavan Rural Hospital, Latur. Total 100 patients of pneumonia were selected and were allotted to two groups by using the Stratified randomization containing 50 patients each. Group I (study group): Zinc along with antibiotics given. Group II (control group): Only Antibiotic; No Zinc supplementation given. Informed consent was taken from parents of the eligible children for participation in the study. Eligible children were randomly selected in study and control group. Each child was given a unique child identification number. Zinc or placebo syrup bottles were labelled with unique child identification number. Baseline data of all the children was collected on prestructured and pretested proforma by directly interviewing parents or guardians of children. Enrolled children were given standard treatment for pneumonia in the form of oxygen, intravenous fluids, bronchodilators and parenteral antibiotics. Intravenous fluids were removed once respiratory distress had settled and child accepting orally. Zinc group received 20 mg of elemental zinc per day as a single dose for seven days. The study group and control group were examined daily from the date of admission till date of discharge. Total duration of hospital stay was counted at the time of discharge in both groups. **Results:** The age and sexwise distribution in zinc and no zinc group showed no statistically significant difference. Among the various danger signs observed inability to drink was observed in 50% cases in zinc group and 40% in non zinc group. It was followed by lethargy (38% zinc and 30% no zinc group). Contact with patient with RTI was the most common risk factor observed. Signs of retraction such as nasal flaring, sub costal retraction, sub sternal retraction, inter costal retraction and grunting was present in some cases in both the groups with nearly same distribution. The mean time required for disappearance of danger sign was 52.3±31.69hrs in zinc group and 64.64±27.81hrs in no zinc group. The difference observed in time required for disappearance of danger sign was statistically significant. It was observed that 84% patients from zinc group had hospital stay of 4-7 days whereas in no zinc group 74% had hospital stay of 4-7 days. The mean duration of hospital stay in zinc group was 6.16 ± 1.35days and in no zinc group was 6.6 ± 1.4days and the difference observed was statistically insignificant. **Conclusion:** The danger signs were relieved faster in zinc group with statistically significant difference. Even though the difference was not statistically significant, Zinc has reduced the mean duration of hospital stay. Thus the study on large group of patients will elaborate the results in detail.

Keywords: pneumonia, zinc, hospital stay.

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Pneumonia is an inflammatory condition of the lung. It is often characterized as including inflammation of the parenchyma of the lung (that is, the alveoli) and abnormal alveolar filling with fluid (consolidation and exudation).¹ Worldwide pneumonia is leading cause of pediatric morbidity and Mortality². WHO has estimated that each year pneumonia kills up to 2.4 million Children, which accounts for 19% of all deaths in the under-five age group³. The Incidence of pneumonia is more than 10-fold higher and the number of childhood-Related deaths due to pneumonia approximately 2000-fold higher in developing Countries than in developed countries⁴. Approximately

95% of the pneumonia related deaths occur in developing countries and the younger age group has the highest risk of death⁴. India contributes nearly 20%⁵. Zinc is an essential mineral of "exceptional biologic and public health importance"⁶. Zinc is an essential nutritional element, with a broad spectrum of biological activities in humans. This element plays an important and vital role in the physical development of digestive and immune systems. Zinc deficiency in children can cause stunted growth and increased incidence of infections (pneumonia, gastroenteritis) through weakening the immune system and changing neural and behavioral actions^{4,5,8,9}. Malnutrition plays a significant role in the increased prevalence, severity, and prognosis of pneumonia, especially among children⁹.

MATERIAL AND METHOD

The present study was conducted in the department of pediatrics of MIMSR medical college and Yashvantrao Chavan Rural Hospital, Latur. Total 100 patients of pneumonia were selected for the study by using following inclusion and exclusion criteria.

Inclusion Criteria

- Children in age group 3-36 months diagnosed to have Pneumonia.

Exclusion Criteria

- Children below 3 months and above 36 months.
- Immunodeficient Patient or associated Symptom and signs of other systemic Disease.
- Recurrent Cases of Pneumonia or other Respiratory disorders.

The selected 100 children were allotted to two groups by using the Stratified randomization containing 50 patients each..

- **Group I (study group):** Zinc along with antibiotics given.
- **Group II (control group):** Only Antibiotic; No Zinc supplementation given.

Informed consent was taken from parents of the eligible children for participation in the study. Eligible children were randomly selected in study and control group. Each child was given a unique child identification number. Zinc or placebo syrup bottles were labelled with unique child identification number. Data collection was done on prestructured and pretested proforma by directly interviewing parents or guardians of children. Proforma was including basic information (Age, Sex, Religion, Address, Socioeconomic status, etc.). Chief complaints, signs and symptoms, general, systemic examination, CBC and Radio-graphical findings of chest were also noted. At admission we also calculated respiratory rate for one minute and chest indrawing was observed. The oxygen saturation (by pulse oximetry), auscultation findings (crepts, wheeze, bronchial breath sounds) and danger signs (cyanosis, inability to feed, lethargy, unconsciousness, convulsions, stridor) were recorded. Special attention was given to Signs Suggestive of Respiratory Distress such as Tachypnea, Grunting, Nasal Flaring, Respiratory Distress, Cyanosis, etc. Enrolled children were given standard treatment for pneumonia in the form of oxygen, intravenous fluids, bronchodilators and parenteral antibiotics. Intravenous fluids were removed once respiratory distress had settled and child accepting orally. Zinc group received 20 mg of elemental zinc per day as a single dose for seven days. The study group and control group were examined daily from the date of admission till date of discharge. Total duration of hospital stay was counted at the time of discharge in both groups.

RESULTS

Table 1: Age and sexwise distribution of children

Group	Group I (Zinc group)		Group II (No zinc group)		P value	
	No.	%	No.	%		
Age	≤1 year	20	40	25	50	$\chi^2=1.01, df= 1, p=0.3149$
	>1 year	30	60	25	50	
Sex	Male	26	54	19	38	$\chi^2=1.98, df= 1, p=0.1594$
	Female	24	48	31	62	

In the present study it was seen that 40% children in zinc group were less than one year of age where as 50% in non zinc group less than one year of age. The age and sexwise distribution in zinc and no zinc group showed no statistically significant difference.

Table 2: Distribution of children according to danger signs and risk factors

		Group I (Zinc group)		Group II (No zinc group)		P value
		No.	%	No.	%	
Danger signs	Unconsciousness	0	0%	0	0%	Non significant
	Lethargy	19	38%	15	30%	Non significant
	Inability to drink	25	50%	20	40%	Non significant
	Cyanosis	0	0%	1	2%	Non significant
	Stridor in calm	2	4%	1	2%	Non significant
	Convulsions	1	2%	1	2%	Non significant
	Nil	25	50%	30	60%	Non significant
Risk factors	Bottle feeding	1	2%	1	2%	Non significant
	Indoor air pollution	1	2%	0	0%	Non significant
	PEM	2	4%	2	4%	Non significant
	LBW	2	4%	1	2%	Non significant
	Contact with respiratory tract infection (RTI)	8	16%	5	10%	Non significant
	Nil	37	74%	41	42%	Non significant

* Multiple responses were obtained

Among the various danger signs observed inability to drink was observed in 50% cases in zinc group and 40% in non zinc group. It was followed by lethargy (38% zinc and 30% no zinc group). Stridor in calm was observed in 4% cases in zinc group and 2% in no zinc group. Convulsions were observed in 2% cases in each group.

No case of unconsciousness was observed in the present study. Contact with patient with RTI was the most common risk factor observed in the present study. LBW, PEM, Indoor air pollution and Bottle feeding were the other risk factors observed.

Table 3: Distribution of children according to Retraction

Retraction*	Group I (Zinc group)		Group II (No zinc group)		P value
	No.	%	No.	%	
Nasal flaring	4	8%	3	6%	Non significant
Sub costal retraction(SCR)	17	34%	13	26%	Non significant
Sub sternal retraction (SSR)	30	60%	24	48%	Non significant
Inter costal retraction(ICR)	29	58%	20	40%	Non significant
Grunting	1	2%	1	2%	Non significant
Nil	17	34%	23	46%	Non significant

*Multiple responses were obtained

Signs of retraction such as nasal flaring, sub costal retraction, sub sternal retraction, inter costal retraction and grunting were present in some cases in both the

groups with nearly same distribution. The difference observed also statistically insignificant.

Table 4: Distribution according to time for disappearance of danger signs

Time	Group I (Zinc group)		Group II (No zinc group)		P value
	No.	%	No.	%	
0-24hrs	9	18%	1	2%	X ² =13.60, df= 6, p=0.0337
24-48 hrs	19	38%	12	24%	
48-72 hrs	12	24%	22	44%	
72-96 hrs	6	12%	9	18%	
96- 120 hrs	1	2%	4	8%	
120-144 hrs	2	4%	1	2%	
144-168 hrs	1	2%	1	2%	
Mean ± SD	52.3±31.69		64.64±27.81		

It was observed that in majority of the cases of zinc group danger signs disappeared in 24 to 72hrs whereas in no zinc group within 24 to 86hrs. The mean time required for disappearance of danger sign was 52.3±31.69hrs in zinc

group and 64.64±27.81hrs in no zinc group. The difference observed in time required for disappearance of danger sign was statistically significant.

Table 5: Distribution according to hospital stay

Hospital stay	Group I (Zinc group)		Group II (No zinc group)		P value
	No.	%	No.	%	
<3 days	0	0%	0	0%	X ² =1.51, df=1, p=0.219
4-7 days	42	84%	37	74%	
7-10 days	8	16%	13	26%	
>10 days	0	0%	0	0%	
Mean ± SD	6.16 ± 1.35		6.6 ± 1.4		0.1122

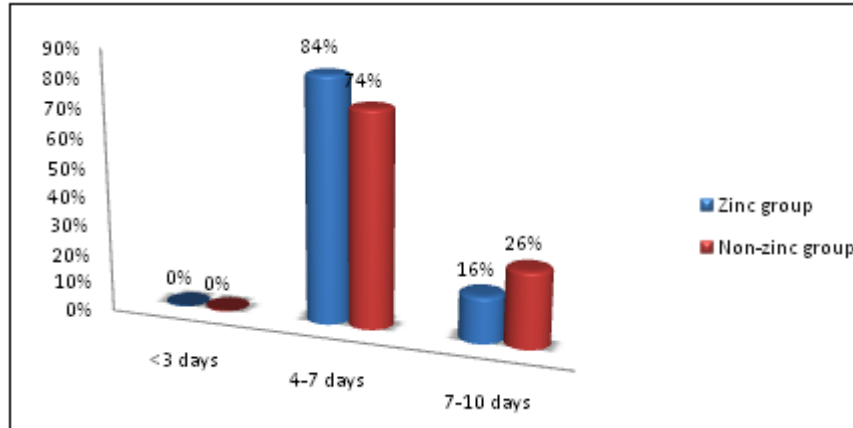


Figure 1: Distribution according to hospital stay

It was observed that 84% patients from zinc group had hospital stay of 4-7 days whereas in no zinc group 74% had hospital stay of 4-7 days. The mean duration of hospital stay in zinc group was 6.16 ± 1.35 days and in no zinc group was 6.6 ± 1.4 days and the difference observed was statistically insignificant.

DISCUSSION

The present study was conducted in the department of pediatrics of MIMSR medical college and Yashvantrao Chavan Rural Hospital, Latur with the objective to study the effect of zinc on hospital stay observed in patients of pneumonia. It was seen that 40% children in zinc group were less than one year of age where as 50% in non zinc group less than one year of age. The difference observed in age distribution was not statistically significant. Similar findings were also observed by Ehsan *et al*¹⁰ and Ajvith *et al*¹¹. The sex wise distribution in zinc and no zinc group was no statistically significant. The male to female ratio was 1:1.22 which in contrary to the findings observed by Ajvith Ganguly *et al*¹¹ (2:1) and Bose *et al*¹² (2:1) in their studies. Various danger signs present at the time of admission were also studied and it was observed that in 55% cases danger signs were not present. While inability to drink was the most common sign observed. It was followed by lethargy. Stridor in calm (3%) and Convulsions (2%) were also observed. The proportion of danger sign in zinc and no zinc group was not statistically significant. It was seen that contact with patient with RTI

was the most common risk factor observed in the present study. LBW, PEM, Indoor air pollution and Bottle feeding were the other risk factors observed. Signs of retraction such as nasal flaring, sub costal retraction, sub-sternal retraction, inter costal retraction and grunting was present in some cases in both the groups with nearly same distribution. The difference observed also statistically insignificant. It was observed that in majority of the cases of zinc group danger signs disappeared in 24 to 72hrs whereas in no zinc group within 24 to 86hrs. The mean time required for disappearance of danger sign was 52.3 ± 31.69 hrs in zinc group and 64.64 ± 27.81 hrs in no zinc group. The difference observed in time required for disappearance of danger sign was statistically significant. It was seen that the duration of hospital stay was less in zinc group when compared with Non zinc group. The mean duration of hospital stay in zinc group was 6.16 ± 1.35 days and in no zinc group was 6.6 ± 1.4 days and the difference observed was statistically insignificant. Brooks *et al*¹³ and Ehsan *et al*¹⁴ also observed less hospital stays in zinc group as compared to no zinc group. According to the results of the present study and comparing them with other similar studies in this field, it can be inferred that zinc can hasten the recovery from pneumonia and quickly resolve its symptoms in children suffering from this disease. Overall, using zinc along with antibiotic therapies is recommended in this group of children. Hence, in order to improve the clinical course and duration of symptoms, it is recommended to administer zinc supplementation to the children with

suspected respiratory symptoms on their arrival at the hospital. Similar findings were also reported by Black R.E *et al*¹⁵ Lassi ZS *et al*¹⁴, Mohammad Javad Qasemzadeh *et al*¹⁶ and Tejesh Malla¹⁷ in their studies. Thus we recommend that further studies with larger sample sizes would be useful in confirming the results of this study and reaching a conclusive opinion in this field.

CONCLUSION

The danger signs were relived faster in zinc group with statistically significant difference. Even though the difference was not statistically significant, Zinc has reduced the mean duration of hospital stay. Thus the study on large group of patients will elaborate the results in detail.

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