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Research Article

Effect of Severity of Malnutrition on Pneumonia in Childern Aged 2M-5Y at a Tertiary Care Center in Khammam, Andhra Pradesh: A Clinical Study

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Abstract: Pneumonia has become the number one cause of under-five mortality contributing to 19% of deaths all over the world. More than 95% of all new cases of pneumonia in children, less than 5 years occur in developing countries, due to increased prevalence of under nutrition. Morbidity and mortality due to Pneumonia is unacceptably high in malnourished children. Objective of the present study was to find out an association between severity of under nutrition and Pneumonia in children aged 2m-5y, those admitted in Mamata General Hospital, Khammam, from August 2012 to July 2013. Malnourished children of either gender from 2m-5y of age with the clinical diagnosis of severe Pneumonia, made according to WHO guidelines and radiologically confirmed cases, were classified into various grades of nutritional status based on IAP classification of malnutrition. A total of 150 malnourished children between 2m-5y admitted in pediatric ward were studied. 110 children had Non-significant malnutrition (grade I&II) and 40 had significant malnutrition (grade III&IV). Of total 69 children with Pneumonia, 47(31%) had severe and 22(15%) had very severe Pneumonia. 43(39%) of children with Non-significant malnutrition had Pneumonia compared to 26(65%) of children with Significant malnutrition (P value < 0.05). Of them 10(9%) of non-significant malnutrition had very severe Pneumonia compared to 12(30%) of Significant malnutrition. Tachypnea (91%), chest indrawing (88%), fever (72%) and cough (66%) were the commonest presentations. 20 (48.7%) of Non-significant malnutrition had >7ds of hospital stay compared to 18 (78.3%) of Significant malnutrition (P value <0.05). 5 (7%) with Pneumonia have expired. Malnutrition is a significant risk factor for Pneumonia. Severity of malnutrition is a significant risk factor for increased severity of Pneumonia, longer duration of hospital stay and mortality from Pneumonia in children under 5yrs.
Keywords: Malnutrition, Pneumonia, Pneumonia

INTRODUCTION

Pneumonia is major cause of Childhood morbidity and mortality in developing world where there is a major burden of malnutrition. Recent estimates from UNICEF show that pneumonia continues to be the number one killer of children around the world, causing 19% of all child mortality, an estimated 1.3 million child deaths in 2011 alone [1]. More than 99% of all pneumonia deaths occurring in developing countries, and three-quarters take place in just 15 countries. In countries like India, pneumonia is the leading cause of death, accounting for 2 Million deaths annually in children younger than 5 years. And the annual incidence of Pneumonia in developing countries is 10-12 times higher than in a developed country that is 10-20/100. However incidences exceeding 50 /100 occur with high prevalence's of Malnutrition and high HIV infection rates in children. More than 95% of all new cases of pneumonia in children, less than 5 years occur in developing countries, due to increased prevalence of undernutrition, which is implicated in 53% of all deaths among children less than 5 years [2]. India needs a special mention in the context of childhood pneumonia. In the numerical term, with 43million new cases every year, India tops the list of 15countries across the world with high disease burden. Morbidity rates tend to vary between 0.2 to 0.5 episodes per child-year and approximately 10 to 20 per cent of these episodes tend to be severe. 50% of World's Pneumonia deaths occur in India which means approximately 3.7 lakh children die of Pneumonia annually in India [2].

Many studies performed in developing countries, particularly in South America and asia have shown consistent, significant and dose-response relationships between malnutrition and both incidence and mortality because of acute respiratory infection in children. In Fortaleza and Brazil it has been found that moderate and severely underweight children were 4.6 times more prone to develop pneumonia. But mortality studies have

revealed malnourished children to have between and 25 times the risk of death from pneumonia. The dose-response relationships in almost all studies notably have shown that even relatively mild degrees of malnutrition increases risk for pneumonia [3, 4].

Pneumonia in a severely malnourished child can often remain occult and yet be significantly much more lethal. Common bacterial pathogens in such children differ from those reported in children without severe malnutrition with more frequent infections with *Klebsiella pneumoniae*, *Staphylococcus aureus*, and *Escherichia coli* [5, 6].

Important underline role of Malnutrition in child deaths is that most nutritional deficiencies impair immune function and other hosts defenses leading to a cycle of long lasting and most severe infections and ever worsening nutritional status. Other facts such as socio- economic status, lack of breast-feeding, nutritional deficiencies, and Non Vaccination and co existing illness also play a role in the causation of infection in malnourished host. The factors that depress the nutritional status of the susceptible child seem to be the very factors that magnify the severity of infectious diseases like Pneumonia [7]. With the above in mind, an attempt has been made to study the magnitude and severity of Pneumonia among malnourished children, admitted in pediatric ward, Mamata General Hospital, Khammam.

MATERIALS AND METHOD

150 malnourished Children of either sex between the age group of 2m-5yrs, admitted in pediatric ward, Mamata General Hospital, Khammam were included in the study. Detailed history, general physical examination and systemic examination were done on all malnourished children. Chest X-ray was done in all malnourished children with pneumonia. Investigations to rule out other systemic diseases were done.

Criteria for diagnosis

Malnourished children were diagnosed to be suffering from Pneumonia based on WHO guidelines and by radiological confirmation. All the children 2m-5y were assessed for Undernutrition according to IAP guidelines. All patients were treated based on guidelines laid by Indian Academy of Pediatrics for the treatment of Pneumonia.

Grade of PEM: IAP classification

Grade I	71-80%
Grade II	61-70%
Grade III	51-60%
Grade IV	<50%

Grading of pneumonia- WHO classification

	Pneumonia	**Severe pneumonia**	**Very severe pneumonia**
Fast breathing	+	+	+
Chest indrawing	-	+	+
Very severe illness	-	-	+

*Fast breathing: Respiratory rate: 2-12m > 50; 12m-5y > 40

*Very severe illness: Inability to suck or drink, altered sensorium, convulsions, grunting, stridor, Cyanosis, hypothermia.

Treatment

All patients were treated based on guidelines laid by Indian Academy of Pediatrics for the treatment of Pneumonia.

Exclusion Criteria

- Children with HIV infection or babies born to HIV positive mothers were not taken in to consideration.
- VLBW/IUGR and Syndromic children babies are not taken in to the study.
- Children suffering from underlying chronic systemic diseases were not included in the study.

Limitations

- Only the malnourished children admitted in the hospital were included in the study. So it does not give the exact magnitude of Pneumonia in malnourished children in the community.
- Only children with severe and very severe pneumonia are included in the study as only these children are admitted in hospital.
- The other factors associated with pneumonia which prolong the duration of hospital stay among undernourished children were not considered.

RESULTS

The total numbers of malnourished children studied were 150, in which 77 were male and 73 were females. In the present study, 45 children belonged to grade I PEM, 65 to grade II, 22 to grade III and 18 to grade IV. Total numbers of malnourished children with Pneumonia were 69.

The incidence of pneumonia was found to be increasing with increasing severity of malnutrition. The incidence being 35.5% in grade I compared to 72% in grade IV. The severity of Pneumonia was found to be increasing with increasing severity of malnutrition. The incidence of very severe Pneumonia was found to be higher in Grade IV PEM compared to lesser degrees of malnutrition (Table 1).

Table 1: Severity of pneumonia in different grades of PEM

Grade of PEM	No of children	No. of children with pneumonia	No. of children with severe pneumonia	No. of children with very severe pneumonia	Children with hospital stay >7ds
Grade I	45	16(35.5%)	12(26.6%)	4(8.8%)	6(37.5%)
Grade II	65	27(41.5%)	21(32.3%)	6(9.2%)	14(52%)
Grade III	22	13(59%)	7(31.8%)	6(27.2%)	9(69%)
Grade IV	18	13(72%)	7(38.8%)	6(33.3%)	9(69%)
Total	150	69(46%)	47(31.3%)	22(14.6%)	38(55%)

In the present study, 8.8% of Grade I PEM had very severe pneumonia compared to 33.3% of children with Grade IV PEM. Our study also shows that duration of hospital stay among malnourished children with Pneumonia was increasing with increasing severity of malnutrition. 37.5% of grade I PEM had >7ds of hospital stay compared to 69% of grade IV PEM. 5 children expired during treatment, of them 1 each belonged to grade I, II and III, and 2 belonged to grade IV.

For convenience to calculate P value grade I and II were included under not significant malnutrition and grade III and IV were included under significant malnutrition (Table 2)

Table 2: Severity of pneumonia in malnutrition

PEM	Severe pneumonia	Very severe pneumonia	>7ds 0f hospital stay
Not significant	33(30%)	10(9%)	20(46.5%)
Significant	14(35%)	12(30%)	18(69%)
Total	47(31%)	22(15%)	38(55%)

Results have shown that greater (30%) no of children with significant PEM had very severe pneumonia compared to children with Non- significant Pneumonia (9%) (Table 2). As p value is <0.05 it is statistically significant. The incidence of severe and very severe Pneumonia was compared between male and female was found to be almost equal. Children with significant PEM with Pneumonia were found to have longer duration of hospital stay compared to children with not significant PEM. The results have shown that 46.5% of significant PEM had longer than 7ds of hospital stay compared to 69% of not significant PEM (Table 2). As p value is <0.05 it is statistically significant.

In the present study, clinical presentation of malnourished children with pneumonia showed Tachapnea (95%), Chest indrawing (90%), Fever (72%), Cough (66%), Refusal of feeds (15%) and Cynosis (5%).

Table 3: Chest X-ray in relation to grade of Malnutrition

Grade	Unilateral	Bilateral	Total
I	6(37.5%)	10(62.5%)	16
II	11(40.7%)	16(59.2%)	27
III	3(23%)	10(70%)	13
IV	1(7.6%)	12(92.3%)	13
Total	21(30%)	48(70%)	69

Table 3 shows, 92% of Grade IV PEM children with bilateral presentation on chest x-ray compared to 62.5% of children with Grade I PEM. Bilateral involvement (alveolar infiltrates) (48), unilateral involvement (21), consolidation (6), empyema (1), collapse consolidation (1) and Pleural Effusion (3) respectively.

DISCUSSION

In this study 150 malnourished children </=5yrs were admitted in Pediatric ward, Mamata General Hospital, Khammam, Andhra Pradesh were studied for the prevalence and severity of Pneumonia. The relation between severities of malnutrition with severity of pneumonia was studied. The duration of hospital stay for pneumonia in relation to the severity of malnutrition was also studied.

As the prevalence of pneumonia was made from malnourished children admitted in ward, only children

with severe and very severe Pneumonia were included in the study. Results have showed very high incidence of Pneumonia among malnourished children, the prevalence being 46%. In this study the result was found to be statistically significant .similar study done by M. R. Savitha *et al*. [8] on 104 malnourished children in the age group of 1m-5y showed significant increased risk of pneumonia in malnourished children. Numerous studies in developing countries, particularly in South America and Asia, Have shown consistent, significant and dose-response relationships between malnutrition and both incidence of, and mortality due to, ARI in children [3, 4]. Also in the present study socio-economic status was found to be an important risk factor. Most of them with pneumonia belonged to class V. Similar relation was found in other studies [8, 9].

The severity of pneumonia was found to have good co-relation to severity of malnutrition. In this study children with grade III and grade IV protein energy malnutrition were found to have higher risk of contacting pneumonia and the incidence of very severe pneumonia was found to be high in this children. The incidence of severe and very severe pneumonia together being 35.5% in grade I compared to 72% in grade IV. In the present study the incidence of very severe Pneumonia was found to be higher in Grade IV PEM compared to lesser degrees of malnutrition. It is 33.3% in grade IV compared to 8.8% in grade I. Similar co-relation was found in other studies [8-11]. As the P value was found to be less than 0.05 this is statistically significant. Impaired local and systemic immunity in malnourished children is a likely explanation for the increased severity of pneumonia.

Children with younger age were found to have higher incidence of pneumonia. In this study out of 150 children,21 children under 1y and 17 children between 1y to 2y and 15 children between 2y to 3y, were found to have Pneumonia compared to 7 children in 3y to 4y and 9 children in 4y to 5y.The prevalence of very severe Pneumonia was found to be highest in children <1year.

Tachypnea was found to be a very sensitive indicator of Pneumonia, was found in 96% of children in this present study followed by chest in drawing found in 90%. Refusal of feeds and cynosis was found to be a good indicator of fatality. Similar study done in Mexico showed that in children with low weight for age (< 1 Z-score), tachypnea had a sensitivity of 83% [13].

The duration of hospital stay for malnourished children with Pneumonia was also calculated. The results showed 45% of children had < or =7ds of hospital stay and 55% had >7ds of hospital stay. Children with significant malnutrition (grade III and grade IV) had longer duration of hospital stay compared to non- significant malnutrition (grade I and grade II).The results have shown that 69% of significant PEM had longer than 7ds of hospital stay compared to 46.5% of not significant PEM(Table 2). p value was found to be 0.03.As P value is <0.05 it's statistically significant. Younger age, severity of pneumonia and under nutrition is significant risk factors for morbidity, prolonged hospitalization and mortality in young children with pneumonia [11].

Out of total 69 children with Pneumonia 5 children have expired. Among them 1 each belonged to grade I, II and III. 2 belonged to grade IV. Malnourished children with Pneumonia have higher fatality rates [11, 14, 15]. In the present study children who expired belonged to younger age group. Children under 1 year of age, females**,** malnourished children, and children with symptoms for more than 7 days are at increased risk of severe disease and of dying [12]. Mortality studies have shown malnourished children to have between 2 and 25 times the risk of death from pneumonia [3]. The dose-response relationship found in almost all studies is notable in showing that even relatively mild degrees of malnutrition. In the present study chest X-ray finding among pneumonia patients showed bilateral involvement in most of the patients. 70% had bilateral chest X-ray abnormality. And the incidence of bilateral involvement increased with increasing degree of malnutrition. In the present study 92% of grade IV malnourished children with pneumonia had bilateral involvement compared to 62% of grade I malnourished children. Children with moderate and severely underweight children were 4.6 times more likely to develop radiologically confirmed pneumonia compared to adequately nourish counter parts [4]. While mortality studies have shown malnourished children to have between 2 and 25 times the risk of death from pneumonia [3].The dose-response relationship found in almost all studies is notable in showing that even relatively mild degrees of malnutrition.

CONCLUSION

To conclude, magnitude of Pneumonia in malnourished children (2M-5Y) was studied at Mamata General Hospital, Khammam, showed increased prevalence of Pneumonia among malnourished children. And the severity of Pneumonia increased with increasing severity of malnutrition being 40% in not significant malnutrition to 63% in significant malnutrition.

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