

A Prospective Study to Assess Outcome and Complications in Children Less than 5 years of Age Admitted to Hospitals with Severe and Very Severe Pneumonia.

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Abstract

Aim: To assess outcome and complications in children less than 5 years of age admitted to hospitals with severe and very severe pneumonia.

Materials and Methods: The present prospective longitudinal observational study was conducted in the Department of Paediatrics, Bokaro General Hospital, Bokaro Steel City, Jharkhand for One year. At admission demographic data of all 299 patients such as name, age, sex, socioeconomic status and clinical details of all the enrolled cases (severe and very severe pneumonia) were recorded in a predesigned proforma. Their detailed history / symptomatology (fever, cough, difficulty in breathing, altered sensorium, convulsion, inability to feed, level of consciousness, respiratory rate, chest retraction, grunting dehydration and auscultatory signs-crackles and wheeze, lab findings like leukocytosis, oxygen saturation at the time of admission were recorded. They were subjected to chest radiography and radiological findings of all the enrolled subjects were recorded. They were treated with parenteral antimicrobial therapy along with supportive measures as per standard treatment protocol adopted by the treating paediatrician. They were also assessed for presence of hypoxia (oxygen saturation SpO₂ <95 %) need for assisted ventilation and final outcome during hospitalization. The possible outcome was “discharged (those children who recovered after treatment as per treating pediatrician) or” Death”.

Results: Out of 299 subjects 65.9% (197) children were diagnosed as severe pneumonia, and 34.1% (102) were diagnosed as very severe pneumonia according to the WHO criteria for defining pneumonia severity. Out of 299 subjects, 195(65.2%) subjects with severe and very severe pneumonia were below 1 year of age. 203 (67.9%) were males, 96(32.1%) were females. Out of 299 subjects, 203(67.9%) had no h/o refusal to feed and 96(32.1%) had h/o refusal to feed. 90(30.1%) had only intercostal retractions, 208(69.6%) had both subcostal+intercostal retractions. 232(77.6%) had bilateral crackles. out of 299 subjects, 110(36.8%) were exclusively breast feed, 189(63.2%) were received formula feed. Out of 299 subjects, 110(36.8%) children had previous NICU admission. Only single death (0.3%) was occurred, 298 patients (99.7%) were recovered. Out of 299 subjects, 262(87.6%) children had complications and 37(12.4%) children had no complication.

Conclusion: The present study concluded that 65.2% subjects with severe and very severe pneumonia were below 1 year of age. Only single death was found. Early diagnosis and treatment is very essential to avoid the complications, morbidity and mortality

Keywords: pneumonia, children, complications, mortality

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Introduction

Acute respiratory infections (ARIs) are an important public health concern and are widely recognized as the major cause of mortality and morbidity among under- five children. On an average, children below 5 years of age suffer about 5 episodes of ARI per child per year, thus accounting for about 238 million attacks. As much as 30-50 percent of hospital visits and 20-30 percent of admissions to hospitals can be attributed to ARI. Pneumonia kills more children than any other disease (more than AIDS, malaria and measles combined). It has been accounted, that worldwide more than 1.1 million under 5 years of age children die from pneumonia each year accounting for as much as 17 percent under-five deaths. ARI is among one of the major causes of death in Indian states and districts with high child mortality rates. In India, during the year 2017 about 42.19 million cases of ARI were reported. During 2017 about 3,254 people died of ARI and 4,105 died of pneumonia. Pneumonia was responsible for about 18 percent of all under 5-year deaths in India [1].

Global health-care agencies such as the World Health Organization (WHO), United Nations Children's Fund (UNICEF), national and state Governments, as well as international and local agencies involved with aid, academics, and research have all focused on this area. The WHO through its ambitious programme "The Global Action Plan for the Prevention and Control of Pneumonia and Diarrhoea" (GAPPD) aims to significantly reduce deaths due to pneumonia. Other institutions such as United Nations Children's Fund (UNICEF), various national and state governments as well as various agencies also focus on this area. In India, ARI has been given top priority in all Government programs including the current

Reproductive and Child Health Program, Phase-II (RCH-II) [2].

Various interventions have been done to reduce pneumonia related morbidity and mortality. The GAPPD programme specifically aims to reduce mortality from pneumonia in children less than 5 years of age to fewer than 3 per 1000 live births and reduce the incidence of severe pneumonia by 75% in children less than 5 years of age compared to 2010 levels. Previously in the year 1983, the World Health Organization (WHO) initiated the Acute Respiratory Infection (ARI) control program which led to a significant decline in the infant mortality rate and decline in the mortality of under-fives by 36 deaths per 1000 live births [3]. To understand the impact on morbidity and mortality, a thorough knowledge of the determining factors affecting the outcome of the disease is important. Various studies have evaluated the determinants for mortality in children due to pneumonia. It has been found that factors such as young mothers, young age of child, low education of father, delay in seeking medical care, development of cyanosis, altered sensorium, grunting, associated chest indrawing, hepatomegaly, acute malnutrition, inability to drink, associated loose stools or heart disease, anaemia, rickets and lack of breastfeeding lead to increased mortality [4,12]. Increase in earnings, better standard of living, educational campaigns, improved health awareness and strengthened referral services, an increasing number of pneumonia cases will reach higher healthcare centres [4]. Therefore, the study of pneumonia cases in tertiary health centres is likely to reflect the burden and varying aspects of the disease in the community. Only a few studies previously have performed such an evaluation in developing countries [11,13,15]. Due to

diversity of population in different parts of India and their living conditions, it is difficult to generalize the findings from few studies. Quantification of certain other risk variables which may contribute to mortality and morbidity, and which have not been dealt in detail before could not be included in further studies. As the Bokaro General Hospital is a tertiary care centre having good number of cases of RTI with lot of pollution due to industries like SAIL, CCL, BCCL, ESL, DVC and Dalmia Cement. So this study was planned to assess outcome and complications in children less than 5 years of age admitted to hospitals with severe and very severe pneumonia.

Methodology

The present prospective longitudinal observational study was conducted in the Department of Paediatrics, Bokaro General Hospital, Bokaro Steel City, Jharkhand for One year

Data source:

Data was being collected over a period of 12 months. Children diagnosed as cases of severe and very severe pneumonia (according to the WHO definition) of either sex between age group 2 months to 59 months admitted in paediatric wards and paediatric ICU of this hospital were enrolled in this study.

Sample Size:

Sample size calculation was based on formula for single proportion.

In our unit approximately 15% of patients have complicated pneumonia with a margin of error of 5% around this mean for 95% confidence interval estimated sample was 195.

$$n = [Z^2 \cdot 1 - \alpha / 2P(1-P) / d^2]$$

$$= 1.962 \times 0.15(1-0.15) / 0.052$$

Minimum sample size required $n = 195$

Inclusion criteria:

- Children of age between 2 months to 59 months, hospitalized in the paediatric wards and paediatric ICU, Bokaro General Hospital, with history of fever, cough or difficulty in breathing or both i.e., WHO-defined severe and very severe pneumonia were included in the study.

Exclusion criteria:

- Children with history of asthma, those with history of three or more episodes of wheezing in 1 year or children with reactive airway disease determined as lower chest indrawing getting relieved after two courses of inhaled salbutamol over 30 minutes.
- Children with aspiration pneumonia
- Children with clinically suspected or diagnosed immunocompromised status (HIV ELISA positive mother, having clinical evidence or CD4 count suggestive of advanced to severe immunosuppression and
- Children with WHO defined non severe pneumonia
- Parents who were not willing to participate in this study

Data Collection:

At admission demographic data such as name, age, sex, socioeconomic status and clinical details of all the enrolled cases (severe and very severe pneumonia) were recorded in a predesigned proforma.

The cases were divided into two groups: as per WHO CASE

Definition

- (i) Clinically diagnosed severe pneumonia
- (ii) Clinically diagnosed very severe pneumonia

Their detailed history / symptomatology (fever, cough, difficulty in breathing, altered sensorium, convulsion, inability to feed, level of consciousness, respiratory

rate, chest retraction, grunting dehydration and auscultatory signs-crackles and wheeze, lab findings like leukocytosis, oxygen saturation at the time of admission were recorded. They were subjected to chest radiography and radiological findings of all the enrolled subjects were recorded. They were treated with parenteral antimicrobial therapy along with supportive measures as per standard treatment protocol adopted by the treating paediatrician. They were also assessed for presence of hypoxia (oxygen saturation SpO₂ <95 %) need for assisted ventilation and final outcome during hospitalization. The possible outcome was “discharged (those children who recovered after treatment as per treating pediatrician) or” Death”.

Statistical Analysis

All the data obtained were coded and entered into master chart. Continuous variables (age, biochemical parameters) were categorized. Categorical variables (sex, demographic, risk factors) were expressed in actual numbers and percentage. Categorical variables were expressed in actual numbers and percentage. Categorical variables were compared between pneumonia with complication and pneumonia without complication. Fisher exact test, Chi square test was applied wherever applicable odd's ratio, 95% confidence interval (CI) were calculated to measure the association between risk factor and outcome. All the tests were 2 sided. P<0.05 was considered as statistically significant. Statistical software IBM SPSS version 21.0 was used for data analysis.

Results

In the present study, out of 299 subjects 65.9% (197) children were diagnosed as severe pneumonia, and 34.1% (102) were diagnosed as very severe pneumonia according to the WHO criteria for defining pneumonia severity.

Out of 299 subjects, 195(65.2%) subjects with severe and very severe pneumonia were below 1 year of age. 203 (67.9%) were males, 96(32.1%) were females. 114(38.1%) children belonged to urban area and 185(61.9%) children belonged to rural area. 158(52.8%) children belonged to Lower Middle class, 4(1.3%) belonged to Upper Middle class and 137(45.8%) children belonged to Upper Lower-class family. 148(49.5%) mothers were illiterate, 131(43.8%) mothers were educated upto primary, 11(3.7%) mothers were matriculation and 9(3%) mothers had done higher secondary. (Table 1)

Out of 299 subjects, 203(67.9%) had no h/o refusal to feed and 96(32.1%) had h/o refusal to feed. 90(30.1%) had only intercostal retractions, 208(69.6%) had both subcostal+intercostal retractions. 232(77.6%) had bilateral crackles. out of 299 subjects, 110(36.8%) were exclusively breast feed, 189(63.2%) were received formula feed. (Table 2)

Out of 299 subjects, 110(36.8%) children had previous NICU admission. 88 (29.4%) had h/o previous lower respiratory tract infection. Out of 299 subjects, 273 (91.3%) had fever and 26 (8.7%) had no fever. (Table 3)

Out of 299 subjects, only single death (0.3%) was occurred, 298 patients (99.7%) were recovered. (Table 4)

Out of 299 subjects, 262(87.6%) children had complications and 37(12.4%) children had no complication. In this study we observed the following complications 1. Sepsis, 2.Effusion, 3.Pneumothorax, 4.Respiratory failure, 5.Empyema. Most common complication was Sepsis which occurred in 253 (84.6%) cases. Other complications like Effusion was present in 2(0.7%) cases, Empyema in 3(1%), Pneumothorax in 1(0.3%), and Respiratory failure in 3(1%) cases. (Table 5)

Table 1: Demographic details of the study population

Variables	Frequency	Percent
Age		
<1 Year	195	65.2%
>1 Year	104	34.8%
Gender		
Male	203	67.9%
Female	96	32.1%
Geographical area		
Urban	114	38.1%
Rural	185	61.9%
SES		
Lower Middle class	158	52.8%
Upper Middle class	4	1.3%
Upper Lower class	137	45.8%
Maternal Education		
Illiterate	148	49.5%
Primary	131	43.8%
Matriculation	11	3.7%
Higher secondary	9	3%

Table 2: Characteristic features of the study population

Variables	Frequency	Percent
Refusal to feed		
Yes	96	32.1%
No	203	67.9%
Retractions		
No	1	0.3%
Intercostal alone	90	30.1%
Intercostal + subcostal	208	69.6%
Crackles		
Unilateral	54	18.1%
No	13	4.3%
Bilateral	232	77.6%
Breast feeding		
Yes	110	36.8%
No	189	63.2%
Total	299	100%

Table 3: distribution according to the previous h/o NICU admission, LRTI and Fever

Variables	Frequency	Percent
Previous NICU Admission	Frequency	Percent
Yes	110	36.8%
No	189	63.2%
Previous LRTI		
Yes	88	29.4%
No	211	70.6%
Fever		
Yes	273	91.3%
No	26	8.7%
Total	299	100%

Table 4: Outcome distribution of study subjects

Variables	Frequency	Percent
Diagnosis as per WHO criteria	Deaths	Discharged
Severe pneumonia (n=197)	0	197
Very severe pneumonia (n=102)	1	101
Total (n=299)	1	298
Any complication	Frequency	Percent
Yes	262	87.6 %
No	37	12.4%
Total	299	100%

Table 5: distribution according to complications

Any complication	Frequency	Percent
Yes	262	87.6 %
No	37	12.4%
Total	299	100%

Discussion:

The present study was conducted from June 2019 to May 2020 in the Department of pediatrics, Bokaro General Hospital, Bokaro Steel City. This study was an attempt to assess the outcome and complications in pneumonia in children aged 2 months to 59 months.

In the present study, we found 65.2% subjects with severe and very severe pneumonia were below 1 year of age. A study conducted in Kashmir by Mir AA et al (2012) [16] showed that ARI most

commonly occurred in 1-3 years of age group. Kumar SG et al (2015) [17] observed highest prevalence of ARI in age group 0-12 months (63.2%) followed by 25-60 months (59.5%) as comparatively lower in 13-24 months age group (52.6%). A study by Ramani VK et al (2016) [18] showed that age specific ARI decreased with increasing age and the association was significantly higher for infants (OR=1.94) and for 2-3-year age group (OR=1.84).

In this study we found 67.9% male patient of severe and very severe pneumonia as might be more male patients were admitted

with acute respiratory tract infections. In comparison, Singh and Nayar (1996) [19] and Chhabra et al (1993) [20] also found boys had significantly higher incidence as compared to girls. Kumar SG et al (2015) [17] and Ramani VK et al (2016) [18] also reported higher incidence of ARI among boys than girls.

In our study, we found 61.9% of severe and very severe pneumonia cases belonged to rural area and 38.1% belonged to urban area. In comparison, ARI study conducted in Tripura (1998) [21] reported more incidence in rural areas as compared with urban areas. Sharma et al (1999) [22] found ARI was more common in urban slum area. Prajapati BJ et al (2012) [23] found ARI more common in rural area (26.8%) as compared to urban area (17.7%).

In the present study 158(52.8%) children belonged to Lower Middle class, 4(1.3%) belonged to Upper Middle class and 137(45.8%) children belonged to Upper Lower-class family. Srinivasa S et al (2018) [24] found that majority of children (46%) presented with acute lower respiratory tract infection (ALRTI) belong to low socioeconomic status followed by middle class (38%) and 16% belonging to upper class.

In our study 148(49.5%) mothers were illiterate, 131(43.8%) mothers were educated upto primary, 11(3.7%) mothers were matriculation and 9(3%) mothers had done higher secondary. Another study by Walia et al also reported parental education did not show any correlation with ARI episode/child/year [25]. Azab et al (2014) found that need for mechanical ventilation and prolonged hospital stay were more common among community acquired pneumonia (CAP) cases who had less-educated mothers [26].

In our study we found only one death, case fatality rate was 0.33% maybe due to hospital-based study. In comparison, The Million Death Study (2010) [27] reported

that, 27.6% (99% CI 31.8%-34.1%) deaths were attributable to pneumonia among a total of 12260 deaths in children from 1-59 months. Multicentric study among hospitalized children in Chandigarh, Kolkata and Vellore reported pneumonia case fatality ratios as 1.01%, 2.35% and 0.77% respectively (2010) [28]. Shekhawat YS et al (2016) [29] observed that case fatality rate of pneumonia was 8.5%.

Conclusion:

The present study concluded that 65.2% subjects with severe and very severe pneumonia were below 1 year of age. Only single death was found. Complications found in the study were Sepsis, Empyema, Respiratory failure, Effusion and Pneumothorax. Early diagnosis and treatment is very essential to avoid the complications, morbidity and mortality.

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