

## Correlation between Chest X-ray and Non Severe Pneumonia as per WHO Guidelines


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**Introduction:** Pneumonia or lower respiratory tract infections are considering most common entity responsible for under five morbidity & mortality. WHO guidelines for ARI control programme is universally accepted by most of countries. It has reduced mortality by proper treatment and referral. Although tachypnea is consider single criteria for diagnosis. Many of these children have viral pneumonia or normal x-ray. Although oral antibiotics are prescribed to them but it is actually not needed. **Methods:** All the patients came to paediatric department from January 2013 to July 2014 & diagnosed as pneumonia as per WHO protocol were included in study. It was a prospective, double blind, randomized controlled study of radiological data of all the patients who were diagnosed as pneumonia as per WHO protocol. All the x-rays were read by two experts. **Results:** Of 219 radiographs examined 23 have evidences of pneumonia. 183 patients have normal x-ray. **Conclusion:** Radiology is consider most accurate method for diagnosis of pneumonia. As per WHO protocol these children receive unnecessary antibiotics although many of these children have viral pneumonia. There is need of some cheaper, easily available & more accurate methods to identify etiological organism for pneumonia.

**Keywords:** Pneumonia, WHO guidelines, Non severe pneumonia, X-ray chest

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### Introduction

Acute Respiratory tract infections are most common reason for under five morbidity & mortality in most of the developing countries [1]. 6.3 million under five children died in 2013 due to various reason that is equal to 17000 children each day [2]. In India almost 67.3 % children take some treatment mostly from peripheral health worker. One fourth receives some antibiotics [3].

Pneumonia in pediatric population is bacterial in etiology in most of the patients. There is urgent need of proper antibiotic use to achieve millennium development goal to reduce mortality to two third by 2015 (MDG goal 4) [4, 5]. Many children do not receive proper treatment in early illness specially patients from poor socioeconomic background. Community based case management (CCM) programme is important tool to use proper antibiotics in peripheral health settings [6].

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CCM of pneumonia requires training community health workers (CHWs) to use algorithms developed in the 1980s to assess danger signs in children with a cough, count respiratory & chest indrawing. For management purpose Pneumonia are classified into three categories. Children with danger sign like chest retraction, cyanosis, inability to drink & lethargy needs admission and intravenous antibiotics. They are classified as severe pneumonia whereas those who only have fast breathing can be treated at home with oral antibiotics [7]. Community based management [CCM] is based on clinical criteria on the basis of studies done in 1970-1980. Their validity is questionable now. Most of these studies used chest radiograph as diagnostic tool [8,9]. Most of these studies has shown that fast breathing is common clinical sign in case of confirmed pneumonia by chest radiography. Fast breathing is most important criteria to make a diagnosis of pneumonia on clinical ground. But fast breathing can be a clinical sign present without pneumonia. Fast breathing can occur in infections, malaria, febrile illness, hyperactive airway disorder, bronchiolitis, wheeze associated lower respiratory infection. As per WHO guidelines respiratory rate should be measured in a calm, sleeping and non febrile child. This ideal condition is not possible most of the time. These two reasons make it difficult to validate increased respiratory rate as a single criteria for diagnosis of pneumonia as per WHO protocols [10]. Many of these children receive unnecessary antibiotics for many days as per WHO protocols. This also increases resistance to various antibiotics. We have conducted this study to assess radiological pattern in children who are diagnosed as pneumonia on the basis of WHO guidelines. This will be helpful for peripheral health worker who used respiratory rate as single criteria to make diagnosis of pneumonia.

**Methods**

Study was conducted in tertiary care teaching hospital of central India. All the patients came to paediatric department from January 2013 to July 2014 & diagnosed as pneumonia as per WHO protocol were included in study. It was a prospective, double blind, randomized controlled study of radiological data of all the patients who were diagnosed as pneumonia as per WHO protocol.

**Inclusion criteria**

- 01. Age 2 months to 5 years
- 02. Tachypnea as per WHO protocol

- 03. Not received any prior antibiotics

**Exclusion criteria**

- 01. Previous antibiotics use
- 02. Age less than 2 months or more than 5 years
- 03. Signs of severe pneumonia as per WHO protocol

All the x rays were read by two radiologists. Radiologist was not aware about clinical course and diagnosis of patient. Each Radiologist has given her own assessment independently. Opinion of third radiologist was taken if any confusion. X-rays are classified as Normal, pneumonia or bronchiolitis. As per WHO protocol it is classified into nine categories [11]. If all the findings are normal, it is classified as normal x-ray.

**Data collection & analysis:** Radiological data were entered. SPSS 11.0 software programmes were used for analysis.

**Table 1: classification of parenchymal changes for diagnosis of pneumonia [11]**

Type	Subtypes	
Interstitial		
Alveolar	Lobar	Non Lobar
Mixed		
Peri-hilar		
Collapse or Atelectasis	Lobar	Non lobar
Cavitations	Thin walled	Single
		Multiple
	Thick walled	Single
		Multiple
Milliary		
hyperinflation		
Other abnormalities		

**Results**

In the study period 231 students were included in study. 219 chest x-rays were available for evaluation by radiologist. All the rays were read by two radiologists. Radiologists were having different opinion on 39 x-rays which were evaluated by 3rd radiologist.

**Table 2: Radiological finding of children diagnosed as pneumonia as per WHO protocol**

findings	Radiologist 1 [N=219]	Radiologist 2 [ N= 219]	Radiologist 3 [N=44]
Pneumonia	21	34	10
bronchiolitis	6	15	7
Normal	192	170	27

Final diagnosis was based on agreement by two radiologists out of three. Of 219 radiographs examined 23 have evidences of pneumonia. Bronchopneumonia was present in 12 & lobar pneumonia in 11 patients. Bronchiolitis was another common diagnosis in 13 patients. The remaining 183 patients have normal x-ray picture.

**Table 3: Baseline characteristic of pneumonia diagnosed on the basis of WHO criteria**

Characteristics	Radiological evidences of Pneumonia	
	Present (23)	Absent (183)
Age		
2 months to 1 year	11	101
1 to 5 years	12	82
sex		
Male	13	99
female	10	84
Symptoms and sign		
Fever	23	180
cough	23	175
Difficulty in breathing	20	129
Loose motion	2	13
vomiting	3	18

It is evident from table that pneumonia and respiratory tract infections are common in infants. Nearly 50 percent of children belong to age group below one year. Male children received care more frequently in Indian subcontinent. If we see the symptoms fever and cough are two most important symptoms in patients with radiological evidences with pneumonia. Interestingly both symptoms are also frequently present in patients with normal x-rays. Loose motion and vomiting may be present in few patients.

## Discussion

As per IMNCI protocols Respiratory rate and distress are two significant parameter to make diagnosis of Pneumonia and severe pneumonia. Most children who were diagnosed as pneumonia on the basis of tachypnea (Respiratory rate > 50 and > 40 in the age group 2 months to 1 year and 1-5 years respectively) have no radiological finding on x-ray chest. Chest X-ray is not considering a diagnostic tool in most of the developing world because of non availability of this tool in peripheral part.

Radiology is considering gold standard diagnostic tool for confirmation of pneumonia but its interpretation in children is difficult. Inter-observer error is very common [12, 13]. Interpretation

Depends on experience of radiologist and clinical information available of that patient [14]. Another important fact related with chest radiograph is we cannot differentiate between viral and bacterial pneumonias [15, 16]. Most of the developing countries have very poor healthcare system. A facility of radiography is not available in most of the community health centre and primary health centres. Other drawback includes radiation exposure, cost, time consuming, and revisit to health care provider once x-ray become available.

WHO guidelines recommended simple clinical sign to diagnose pneumonia. WHO guidelines aims for reducing morbidity and mortality in most of the developing world. Peripheral health worker are responsible for delivering health care to most of the peripheral part of the developing world. WHO based classification is simple and easily acceptable by these workers. There are clear guidelines for antibiotic use and referral. Spectrum of respiratory illness in pediatric population is variable it ranges from upper respiratory tract infection to pneumonia, severe pneumonia and wheeze associated lower respiratory tract infection (WALRI).

WHO guidelines should be more specific to define pneumonia. Few experts say that there are no radiological evidences in early pneumonia so they argue on utility of x-ray for diagnosis of pneumonia. Incidence of radiological evidence is high once any illness last for more than 3 days. Many experts argue that radiological evidences are always there with pneumonia.

Earlier data show that non severe pneumonia is mostly viral in origin so use of antibiotics is not justified [17]. Fever is consider important predictor of severe pneumonia [18]. They are associated with more evidences of bacterial pneumonia if fever last for more than 3 days. Although it is not include as a criteria for pneumonia in WHO protocol. Utility of fever in assessment of pneumonia should be further studied so that antibiotic use should be justified in WHO protocol.

Large number of patients with pneumonia diagnosed by WHO protocol is having wheeze. There is no separate management guidelines available for patients with wheeze associated lower respiratory tract infection. Interestingly large number of these children have normal x- ray. But they receive antibiotic treatment as per WHO guidelines. Some studies have demonstrated role of bronchodilator in these situation but role of antibiotics is controversial

[19]. Actually we should adopt some modification in WHO guidelines to prevent use of unnecessary antibiotics.

## Conclusion

As per WHO protocol large number of patient receive oral antibiotics for pneumonia although many of them have normal x-ray on imaging. Radiology is consider most accurate method for diagnosis of pneumonia. In this way these children also receive unnecessary antibiotics although many of these children have viral pneumonia. There is need of some cheaper, easily available and more accurate methods to identify etiological organism for pneumonia. We can prevent antibiotics resistance by this way.

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