Discussion
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Etiology of pneumonia in early infancy is not well described in developing countries, although a number of investigations have focussed on later infancy and preschool years. In developed countries 27 – 30% of cases of prolonged atypical pneumonia are attributed to chlamydia trachomatis in children of upto six months of age.

An important clinical question in treatment of pneumonia in very young infants is whether in the event of patients with atypical pneumonia, not responding to conventional antibiotics like amoxycillin, cephalosporin, treatment of chlamydia trachomatis should be given routinely. We took our study to address this specific question, focussing on infants upto 6 months of age in Bundelkhand region, who had features of atypical pneumonia, like not responding on initial course of conventional antibiotics and without being critically ill. Macrolides like Erythromycin, Roxithromycin are the treatment of choice of this type of pneumonia; Quinolones like Ciprofloxacin and Ofloxacin are also highly effective. Duration of therapy in it is 21 days. The findings of the study while pertinent to this question do not apply to children in community setting or pneumonias at all ages. The findings of this study need to be interpreted with full awareness of these limitations.

Enzyme Linked Immuno Sorbant Assay (ELISA) test was used to detect the serum IgM antibodies against chlamydia
trachomatis. This test is a simple and reliable test, which gives rapid results.

In our study, total fifty infants of upto six months of age with features of atypical pneumonia and fulfilling the inclusion criteria were studied. They were divided into three groups on the basis of age, into less than two months, 2 – 4 months and 4 – 6 months. They were also studied for their association with fever, duration of cough, mode of delivery, conjunctivitis, total leucocyte count and absolute eosinophil count.

We found in our study that the seroprevalence of chlamydia trachomatis in infants of upto 6 months of age having lower respiratory tract infection with features of atypical pneumonia was 24%.

Close to the results of our study, was a study conducted by L. Muhe et al in Ethiopia (1999), in which they reported chlamydia trachomatis in 15.8% infants younger than three months of age, who had pneumonia, sepsis and meningitis. Results in this study were bit low than in our study, and it could be because of infants of only upto 3 months were taken in this study and all the patients with acute lower respiratory tract infection were taken in their study. So, chances of infection with common organisms could be more which will dilute the incidence of incidence of chlamydia. While in our study infants of upto 6 months of age with symptoms of longer duration were taken. Thus, prevalence found in our study was bit more than found by L. Muhe et al.

In a study conducted at AIIMS by S.K. Kabra et al (2003), to identify pathogens responsible for acute lower respiratory tract infection in under five children (mean age 11.2 months), they
found the seroprevalence of chlamydia trachomatis to be 11%. In this study also, patients of larger age group with acute symptomatology for lower respiratory tract infections were taken, thus could be diluting the incidence of chlamydia.

In few other studies conducted at different parts of the world, to find out the etiological agents of acute lower respiratory tract infection in children; Forgie et al (Gambia) in 1991 found the prevalence of chlamydia to be 12% in 1 to 9 years age group hospitalized children; Heiskanen Kosama et al (Finland) in 1998 found the prevalence of 14% for chlamydia in less than 15 years ambulatory children, Wubbel et al (USA) in 1999 found the seroprevalence of chlamydia to be 6% in 6 months to 6 years ambulatory children. The low prevalence rate in these studies compared to our study can be attributed to variable and large age groups of cases taken in these studies and patients with acute symptoms were taken in these studies. Bundelkhand is an area where most of the people are in low socio-economic group and maternal infection with chlamydia trachomatis is more in this socio-economic group of patients. Thus, in infants of this area, when taken upto 6 months of age with features of atypical pneumonia, the prevalence rate for chlamydia trachomatis was found to be more. Nonetheless, all these studies shows that chlamydia is an important cause of lower respiratory tract infection with symptoms of atypical pneumonia in children, and it is not a rare cause as previously thought.

While studying prevalence of chlamydia trachomatis in different age groups, we found that 75% of cases with lower respiratory tract infections positive for chlamydia trachomatis
were of below four months of age. Two infants were positive for chlamydia trachomatis in the age group of below 2 months and one infant was found to be positive at the age of 12 days. According to Manju Salaria and Meenu Singh, usual age of presentation for pneumonia due to chlamydia trachomatis is at 3 weeks to 3 months of life. Margaret A et al (1979), in their study found that upper age limit for pneumonia due to chlamydia trachomatis in infants was of 6 months. However, lower age limit of 4 weeks was uncertain. Colarizi P. et al (1996), in their study on chlamydia trachomatis associated respiratory diseases in the very early neonatal period found that 7.8% of infants were positive as early as within first 24 hours of life and 14.5% cases were positive in infants up to 2 months of age. In 1984, Murdh et al demonstrated by means of the immunofluorescence monoclonal antibody staining test, the presence of chlamydia trachomatis in the postmortem lung tissue of a two days old infant. Attenburrow et al in 1985, reported that out of the five low birth weight neonates who developed a severe pneumonia, one was found to be culture positive for chlamydia trachomatis. These studies show that chlamydia trachomatis infection is also common infection within early neonatal period. That is why we took infants from birth up to 6 months of age in our study.

83% of patients positive for chlamydia trachomatis were born by vaginal delivery, but this association was not found to be statistically significant. It is consistent with previous literature by Drew W Lawrence (1994) that when a woman with an active chlamydial infection gives birth to a baby, the baby may aspirate some of bacteria laden secretions, while passing through birth.
canal. This can cause a form of relatively mild pneumonia in newborn, occurring about 2 to 6 weeks after delivery.

In-utero transmission of chlamydia trachomatis is not definitively known to occur and infants born by caesarian section are considered to have a low risk of acquiring chlamydial infection, unless there has been premature rupture of membranes. P. Colarizi et al (1996) found in their study that chlamydia trachomatis was also detected within 24 hours of life, from preterm infants born by caesarian section without premature rupture of membranes. In a study conducted by Pao et al (1991), they detected chlamydia trachomatis DNA sequences in the amniotic fluid of a substantial proportion of women with urogenital chlamydial infection, thus suggesting an in-utero mechanism by which chlamydia can be transmitted before birth. Thus, while infants born by vaginal route have more chances of acquiring chlamydial infection, but infants born by caesarian section are also at risk of getting this infection.

In our study infants having cough of more than one week duration were taken and we found in our study that positivity of chlamydia trachomatis was more in patients having cough of more than two weeks duration and it was found to be statistically significant ($p$ value < 0.05). Margaret A et al (1979), in their study found that 59% of chlamydia positive infants has paroxysm of staccato coughing. Julius Schachter (1978), in his study found that distinctive cough was present in many of infants with this type of pneumonia. Beem and Saxon (1977), in their study found that a distinctive cough was important finding in infants having pneumonia due to chlamydia trachomatis. Cough usually occurs
as staccato paroxysms that may be followed by periods of vomiting or apnea. Thus, prolonged and distressing cough can give an important clue for the clinical diagnosis of chlamydia trachomatis in these infants.

In our study conjunctivitis was present in 58.3% of patients positive for chlamydia trachomatis. Julius Schachter (1978), in his study found that 55% of infants of pneumonia positive for chlamydia trachomatis had conjunctivitis. Margaret A et al (1979), found in his study that conjunctivitis by history or physical examination or both was recorded in slightly less than half of the chlamydia positive infants. Thus, while the presence of conjunctivitis was quite reliable as a marker of chlamydia infection, the reverse was not true; absence of conjunctivitis by no means ruled out chlamydia disease.

In our study, we found that out of total 18 patients in which fever was absent, chlamydia trachomatis was positive in 7 (38.88%) patients, and out of total 12 patients positive for chlamydia, fever was absent in 58.3% infants. But this association was not found to be statistically significant (p value > 0.05). Julius Schachter (1978) also found that this pneumonia is characterized by afebrile course. Manju Salaria and Meenu Singh (2002), found that inspite of extensive pneumonia, the infant almost always remains afebrile.

An important observation which we found in our study, was that positivity of infants for chlamydia trachomatis was more in those having absolute eosinophil count more than 300 per cu mm. 35.7% of cases with absolute eosinophil count more than 300 per cu mm were positive for chlamydia trachomatis whereas,
only 9.09% cases with absolute eosinophil count less than or equal to 300 per cu mm were positive for chlamydia trachomatis. In our study 83% of total cases positive for chlamydia trachomatis had absolute eosinophil count more than 300 per cu mm. By application of ‘t’ test, this association was found to be significant. Margaret A et al (1979), found in their study that absolute eosinophil count values were commonly elevated in these infants. 71% of total positive infants had count more than or equal to 300 per cu mm. According to Manju Salaria and Meenu Singh (2002), blood examination in these children often shows absolute eosinophilia. The eosinophilia found in these infants positive for chlamydia trachomatis could be due to allergic response from chlamydial infection, thus eosinophilia is an important associated finding in infants of lower respiratory tract infection positive for chlamydia trachomatis.

We found in our study, that positivity of chlamydia trachomatis is not associated with leucocytosis (i.e. total leucocyte count above 11000). Out of 29 patients with total leucocyte count below 11000, 9 (31.03%) were positive for chlamydia trachomatis, and their mean value was 6900 per cu mm with standard deviation of 1.6. Out of 12 cases positive for chlamydia trachomatis, 9 (75%) had total leucocyte count below 11000, but this association was not found significant by application of ‘t’ test. Margaret A et al (1979), found in their study that, total leucocyte counts of infants positive for chlamydia trachomatis to be 7700 per cu mm. P. Colarizi et al (1996), in his study also found total leucocyte count were in normal limits, in infants positive for chlamydia trachomatis. Thus, leucocytosis is

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usually absent in infants with chlamydia trachomatis infection, showing that infection due to chlamydia trachomatis is of low antigenicity.

We found in our study that infants positive for chlamydia trachomatis had variable findings on chest X-ray. Most common finding was of patchy infiltrates. Besides that minimal infiltrates and hyperinflation were also found in the chest X-rays. The classical features of chlamydial pneumonia has hilar and perihilar infiltrates and reticular parenchymal infiltrates were not found in our study. Hence, X-rays were not found to be of much significance for chlamydial etiology.

A report on small sample is difficult to generalize to the whole country, and unfortunately not much data is available on the role of chlamydia trachomatis as a causative agent of pneumonia in infants. However, the data in this study indicate towards the importance of chlamydia trachomatis as a causative agent of prolonged lower respiratory tract infection in very young infants. A detailed study based on community setting is required to describe the actual incidence of chlamydia trachomatis accounting for pneumonia in infancy.