



Pneumonia in Children

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Abstract

Pneumonia in children is an infection of the lung parenchyma by various microorganisms. The severity and type of symptoms depend on the causative agent, so there are several types of pneumonia in children: bacterial, atypical and viral pneumonia in children. The main task of the doctor is to determine whether the pneumonia is viral or bacterial because the treatment varies greatly. Antibiotics will help against bacteria, but they are of no use against viruses and can harm the child by killing the good bacteria in the body. Full recovery in developed countries is expected for every child, while in underdeveloped countries pneumonia is high on the scale of mortality of children up to 5 years of age. Consequences and complications can be expected in children suffering from other serious and chronic diseases.

Keywords: Pneumonia, Children, Signs, Characteristics, Health

Introduction

Pathogens reach lungs either by hematogenous spread or by aspiration [1]. Infections are regularly mindful for bacterial disease. Taking after attack of aspiratory tissue, an intense fiery reaction causes exudation of liquid and polymorphonuclear cells with inevitable fibrin statement and combination.

Solidification of lung tissue diminishes the crucial capacity (VC) and compliance of lungs. Intrapulmonary right to cleared out shunt and ventilation perfusion (V/Q) bungling can cause hypoxia; indeed pneumonic hypertension may happen, which with included hypercapnia, can result in cardiac over-burden.

Age could be a determinant within the clinical signs of pneumonia [2]. Neonates may have fever or hypoxia as it were, with unpretentious or absent physical examination discoveries. With a youthful newborn child, apnea may be the primary sign of pneumonia. Fever, chills, tachypnea, hack, discomfort, pleuritic chest torment, retractions, and apprehension—because of trouble breathing or shortness of breath—are common in more seasoned newborn children and children. Overwhelming highlights of the aspiratory side effects of COVID-19 incorporate hack, fever, dyspnea, and myalgias. Other common highlights incorporate stomach torment and the runs, cerebral pain, sore throat, as well as misfortune of taste or scent sensations. Extreme inclusion incorporates compounding dyspnea, hypoxia, and more noteworthy than 50% lung penetrates on imaging. Basic sickness incorporates respiratory disappointment requiring mechanical ventilation or extracorporeal membrane oxygenation (ECMO) and multiorgan framework brokenness (myocarditis, hypercoagulability, intense kidney harm).

Physical examination discoveries cannot dependably recognize viral and bacterial pneumonias, but total physical examination may offer assistance distinguish other foci of disease or related discoveries to recommend an etiology.

Viral pneumonias are by and large related more regularly with cough, wheezing, or stridor; fever is less unmistakable than with bacterial pneumonia. Mucosal congestion and upper aviation route aggravation recommend a viral contamination. Bacterial pneumonias are regularly related with higher fever, chills, hack, dyspnea, and auscultatory findings of lung combination. Atypical pneumonia in youthful newborn children is characterized by tachypnea, cough, and crackles on auscultation. Concomitant conjunctivitis may be show in newborn children with chlamydial pneumonia. Other signs of respiratory trouble incorporate nasal flaring, intercostal and subcostal retractions, and grunting.

Types

Lobar pneumonia has 4 stages [3]. The introductory arrange is congestion, where the alveoli are filled with fibrinous fluid, neutrophils, and bacteria. This arrange happens inside 24 hours of contamination. The moment arrange as a rule happens on days 2 to 3 and is called ruddy hepatization. The lung blushes and is of the consistency of liver. The alveoli are filled with fibrinous provocative exudates with expanded numbers of neutrophils and red cells that contribute to the color. The solidified flap is airless and apparent on chest radiography. The pleura is more often than not thickened, and a pleural rub may be listened. The following arrange is called dark hepatization, where the alveoli are filled with fibrin strings and neutrophils and the red cells are much less in number. The lung is still stiff, and the alveolar dividers are

thickened and fibrosed. The fourth organize is determination as the incendiary exudates are resorbed.

Bronchopneumonia is more inconsistent and, as the title proposes, there's suppurative irritation of the bronchi and encompassing alveoli. The exudates fill bronchi and bronchioles and influence the adjoining alveoli whereas the removed alveoli may be free of exudates. The inconsistent union may influence one or a few lobes and is ordinarily respective. The lobes more included incorporate the subordinate lung zones and the bases.

Interstitial pneumonia results from aggravation that's inside the alveolar divider instead of the alveolar air space. The infiltrate tends to comprise of lymphocytes and macrophages, and hyaline membranes may line the alveolar spaces. An extra category is miliary, which happens with hematogenous spread to the lung, which leads to numerous discrete injuries frequently all through both lungs.

Bacterial pneumonia frequently takes after a viral upper respiratory infection (URI). Lobar pneumonia is most commonly bacterial, including atypical bacteria. Bronchopneumonia may be caused by bacteria, atypical bacteria, or infections. Interstitial pneumonia may result from measles and Bordetella pertussis, as well as noninfectious causes counting goal. Miliary aspiratory contamination is most commonly seen in tuberculosis, histoplasmosis, and coccidioidomycosis. Immunocompromised children are at chance for miliary herpesvirus, cytomegalovirus, or varicella-zoster virus.

Characteristics

Pneumonia is characterized as inflammation of lung tissue may result from a noninfectious or an infectious cause [1].

Bronchopneumonia is fundamentally a spreading inflammation of the terminal bronchioles and their related alveoli. Lobar pneumonia or solidification could be a obsessive state where the alveolar discuss has been supplanted by cellular exudate and transudate. Pneumonitis is localized inflammation of lung parenchyma due to noninfectious causes. Interstitial pneumonia is characterized by gigantic multiplication and desquamation of alveolar cells and thickening of alveolar walls. Chest X-ray reveals a diffuse hazy, ground-glass appearance, as a rule at lung bases with ineffectively characterized hilar densities. Diligent pneumonia is characterized as tirelessness of indications and roentgenographic anomalies for more than 1 month. Repetitive pneumonia is characterized as two scenes of pneumonia in 1 year or more than three scenes at any time with radiographic clearance between two scenes of ailment.

Pneumonia can be classified anatomically as lobar or lobular pneumonia, bronchopneumonia and interstitial pneumonia. Pathologically there's combination of the alveoli or invasion of tissue with provocative cells. The cause of pneumonia depends on age, resistant status and the nearness of basic constant disease. Certain irresistible specialists are more common at a specific age. Atypical pneumonia is caused by Mycoplasma pneumoniae and Chlamydia. Atypical pneumonia is additionally

called as strolling pneumonia. Components inclining to bacterial pneumonia incorporate expanded number of siblings, parental smoking, preterm conveyance, urban home, destitute financial status, impeded resistant reaction, innate and anatomic abandons, lungs and tracheobronchial tree surrenders, cystic fibrosis, and congestive heart failure.

Signs

The onset is ordinarily sudden with high fever, chills, cough and respiratory distress [4]. Dynamic developments of the alae nasi, grunting, termination and lower costal subsidence with a few cyanosis are disturbing appearances. In a few cases, diarrhea, vomiting convulsions and chest pain (referred to abdomen) may be present.

Chest signs of combination incorporate reduced developments of influenced side, expanded vocal fremitus and resonance, dullness, diminished breath sounds, and bronchial breathing. Crepitations signify starting of determination. There's no moving of mediastinum. Chest signs of bronchopneumonia incorporate tachypnea, ordinary or cruel breath sounds and diffuse unforgiving crepitations spread all over in both the lungs.

World Health Organization has prescribed that exceptionally quick breathing, particularly in association with cough, troublesome breathing or indrawing of chest, must continuously be considered a reflection of pneumonia, unless demonstrated something else. Fever without a doubt causes rise in respiratory rate. But, the impact is as it were frail, say 2–3 breaths per 1°C rise over 37°C per miniature. The cut-off point for high respiratory rate is over 60 per miniature upto 2 months of age, over 50 per minute between 2 months and 12 months and 40 per minute between 12 months and 5 a long time.

In weakened newborn children and children, in spite of the nearness of broad pneumonia, signs and indications may not be as classical. The conclusion of pneumonia in such cases is regularly made taking after point by point examination and a chest radiograph. Nearness of certain inclining components ought to stir doubt for Staphylococcal pneumonia.

Patient

Cough is common indication [1]. It may be absent in newborn children and newborns. Simple perception will give key determination. Tachypnea out of extent to the degree of fever may be the as it were sign in newborn child. Grunting respiration in youthful child stimulate a doubt of pneumonia.

Tachypnea is the foremost delicate record of infection seriousness. The conclusion of pneumonia is characterized as respiratory rate more than 60/min in children underneath 2 months of age, more than 50/min in children between 2 or 12 months of age and more than 40/min in children 1–5 years of age.

Pneumonia may show with intense stomach pain which is ascribed to alluded pain from the pleura. Apical pneumonia may be related with meningismus and convulsions. Localized findings incorporate inspiratory rales, diminished breath sounds and

bluntness to percussion. There may be related stomach pain, highlights of meningism depending on the localization of included lung field.

Staphylococcus and Klebsiella, i.e., gram negative life form produces pneumatocele. Pseudomonas may create diffuse nodular design in lower projections. Anaerobic infections are also associated with lung abscess beside air/fluid levels. Neonatal pneumonia is regularly troublesome to recognize since of a few quirks. These incorporate nonappearance of cough, fever, apneic spells, increment incidence of periodic breathing, grunting, fast clinical deterioration, cyanosis, dynamic discuss hunger and septicemic features.

Complications

These incorporate empyema, pneumothorax, bronchogenic spread, septicemia, osteomyelitis, numerous framework abscesses, septic arthritis and meningitis [1].

Mortality in uncomplicated bacterial pneumonia is 1%. The foremost vital complication is drying out. Other complication incorporates in pleural radiation and empyema. Empyema may expand locally to include pericardium, mediastinum or at the chest divider.

Electrolyte and blood urea nitrogen (BUN) can offer assistance to evaluate the degree of liquid misfortune. Broad inclusion of lung may lead to respiratory failure. Arterial blood gasses are demonstrated on the off chance that child has extreme respiratory trouble or oxygen immersion less than 90%.

Pneumothorax

Pneumothorax could be a possibly deadly issue within the neonate since it can quickly advance to a pressure pneumothorax and in this manner diminish cardiac yield [5]. It is often the result of PPV (Positive-pressure ventilation), positive end-expiratory pressure, or resuscitation.

Pneumothorax is additionally more common in untimely newborn children with surfactant lack and in newborn children with meconium desire. Signs and side effects incorporate snorting respirations; intercostal, sternal, and substernal retractions; lifted respiratory rate; and tachycardia taken after by bradycardia and hypotension. The physical examination discoveries may incorporate lopsidedly diminished breath sounds and removed heart tones. Be that as it may, it regularly may not be conceivable to analyze or localize a pneumothorax by auscultation. Transillumination by a high-intensity light in a dull room will uncover expanded light transmission on the side of the pneumothorax.

In case noteworthy respiratory trouble is display and pneumothorax is suspected, quick decompression may be accomplished with a huge syringe, 20-gauge needle or catheter over needle, and three-way stopcock. The chest is cleansed with clean arrangement, and the needle is progressed at the fourth intercostal space within the front axillary line or the second interspace within the midclavicular line. This will diminish the pressure and decompress the pleural space. In this way, a chest tube may

be set employing a standard strategy. On the off chance that the newborn child is steady, a convenient convenient anteroposterior chest radiograph may be taken to affirm the diagnosis.

Traumatic pneumothoraces shift in their estimate and clinical noteworthiness [6]. They happen in around one-third of children with critical thoracic injury, and related wounds are common. All pneumothoraces ought to be considered as having the potential to cause cardiorespiratory compromise. The clinical signs of pneumothorax (PTX) change from nothing to diminished discuss passage, hyperresonance and subcutaneous emphysema.

Little to medium-sized pneumothoraces may not be obvious on a convenient recumbent CXR (Chest X-ray). Ultrasound of the chest may be consolidated into the Fast (Focused Assessment with Sonography in Trauma) check convention to identify pneumothoraces and haemothoraces. The affectability of ultrasound in identifying these complications of chest injury is prevalent to prostrate CXR, but CT checking remains the gold standard. Inconspicuous signs on CXR incorporate expanded radiolucency on the ipsilateral side and a profound sulcus sign. Little pneumothoraces are commonly uncovered on CT filter of the chest and/or guts. The significance and thus administration of these little pneumothoraces are wrangled about. A little uncomplicated PTX in a steady persistent with confined chest injury, who isn't likely to require positive pressure ventilation or drawn out transport (especially aeromedical), can be considered for perception, tall stream O₂ and absence of pain in a high-dependency unit setting. Most other traumatic pneumothoraces require the inclusion of a formal chest deplete.

Chest X-Ray

Chest roentgenograms most promptly affirm clinical discoveries that are consistent with pneumonia [7]. In numerous cases chest X-rays offer assistance separate viral from bacterial causes. They may indeed recommend particular pathogens. Viral pneumonias are related with 4 roentgenographic discoveries: hyperexpansion, parahilar peribronchial infiltrates, atelectasis, and hilar adenopathy. The latter finding is as it were commonly related with adenovirus. Solidified alveolar or diffuse interstitial invades and expansive pleural radiations are once in a while seen. More severe X-ray changes in youthful newborn children propose respiratory syncytial virus disease.

The chest roentgenogram illustrating contamination with Chlamydia classically uncovers diffuse interstitial penetrates with hyperaeration, peribronchial thickening, and scattered zones of atelectasis. The more broad diffuse interstitial invades that ordinarily go with Chlamydia disease offer assistance recognize this etiology from viral diseases.

Alveolar illness, union, the nearness of discuss bronchograms, and pleural radiations are characteristic of bacterial pneumonia. These roentgenographic discoveries alone manage institution of antimicrobial treatment. Staphylococcus aureus must be suspected in the event that there's prove of a solidified penetrate went with by an emanation or a pneumatocele. This cause is moderately more common in youthful newborn children (<12

months of age) and neonates, and warrants hospitalization and every day roentgenographic observing. The essential reason for rehashing chest X-rays inside 24 to 48 hours is to depict changes congruous with a staphylococcal cause.

Aspiration pneumonia is frequently suspected on clinical grounds such as a preexisting seizure disorder or serious gastroesophageal reflux. Radiographic findings classically incorporate a solidifying invade within the right lower lobe. Youthful patients who aspirate while recumbent, be that as it may, are more likely to create infection within the upper lobes.

Broad annihilation of lung tissue may result within the arrangement of numerous little boil cavities, named necrotizing pneumonia. This roentgenographic finding ought to caution the clinician to the nearness of less common pathogens, counting *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Proteus mirabilis*, other Enterobacteriaceae, and anaerobes. Transcendent life forms are frequently locally interesting, and antibiotic sensitivities for such life forms shift impressively from clinic to clinic. Antibiotic regimens for the most part incorporate a wide range penicillin (for anaerobic scope) also an aminoglycoside (for synergistic action against *Pseudomonas* and other Enterobacteriaceae). In spite of early and suitable antimicrobial treatment, necrotizing pneumonia is often fatal.

Diagnosis

The “gold standard” for documenting both bacterial and viral causes of pneumonia is culture [7]. The most excellent source of culture fabric could be a lung suction. Distributed reports have recommended that bacterial pathogens can be confined in roughly 33% of patients experiencing this method. Such ponders have been one-sided, in any case, since serious cases were more likely to be selected. The normal viral pneumonia with a centrally found parahilar peribronchial invade does not securely loan itself to needle desire. Bacteremia is as it were archived in 9% to 10% of all febrile children with pneumonia whereas more than 50% of community procured cases are bacterial in root.

In neonates, pneumonia is frequently related with generalized sepsis. Life forms recouped are comparative to those embroiled in other genuine contaminations such as meningitis, septic joint pain, and pyelonephritis. A workup for sepsis, counting lumbar cut, is continuously shown in neonates who have febrile pneumonia.

Culture is the as it were dependable strategy of recognizing flu infections. Fast recognizable proof of RSV (Respiratory syncytial virus), in any case, can be accomplished with coordinate fluorescent recoloring or ELISA (Enzyme linked immunosorbent assay) procedures. Moreover, fluorescent recoloring reagents and ELISA that separate other potential viral pathogens, such as parainfluenza infection and adenovirus, are also accessible. Tracheal suction or back nasopharyngeal emissions are required as examples for examination.

Respiratory syncytial infection testing is feasible in community clinics, but other viral societies are more often than not per-

formed in reference research facilities. Unfortunately, because of the time required for confinement and recognizable proof of infections, such tests don't by and large give clinically valuable data.

P. carinii, *U. urealyticum*, and CMV (Cytomegalovirus), must be refined from tracheal suction. *P. carinii* has been effectively recuperated in as it were some research facilities where examinations of this living being are in advance. Discovery of Pneumocystis antigen in serum is additionally performed as it were in inquire about research facilities.

Health Care

Pneumonia can be a terrifying determination both to the child and the child's parents or caretakers [8]. Consolation and legitimate educating is required to guarantee the finest conceivable result for the understanding and the slightest sum of stress for the family. The parent or caregiver should be instructed the signs to screen that would show destitute reaction to treatment or a worsening condition. Signs that warrant quick consideration incorporate hoisted respiratory rate (it is perfect to educate the parents how to require the rate when the child is asleep and give them rules for irregular rates, which is able change with age), enduring fever after 72 hours or a fever that settle and after that returns, cyanosis, tachycardia, confusion, signs of dehydration (dry mucus membranes, absence of tears, and diminished urinary output), difficulty breathing, expanded work of breathing, shortness of breath, or respiratory distress. When giving this instruction, it is critical to clarify these signs in terms the guardians can get it. The family ought to be told how to contact the health-care supplier in case required. Courses of action for legitimate follow-up ought to be made some time recently the child takes off the office or is released.

Expectant direction ought to be given to the family to offer assistance diminish ensuing contaminations. Parents should be empowered to have their children get a annually flu vaccine and the pneumococcal vaccine. They ought to moreover be energized to hone visit hand washing and to maintain a strategic distance from exposures to smoke and other hazard components.

Conclusion

In order to determine pneumonia, it is necessary to take into account the epidemiological situation, age, season, immune status and health condition of the child. Children aged 2-3 are the most affected by viral pneumonia. The most common pathogen among viruses is RSV - in children under the age of 3. Other viruses that cause pneumonia are Parainfluenza virus, Influenza virus, Adeno virus. Of the non-viral pathogens for children under 5 years of age, *Streptococcus pneumoniae*, *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, *Streptococcus pyogenes* and *Staphylococcus aureus* are significant. Viral infections of the lower parts of the respiratory tract occur more often in autumn and winter. Vaccination status is important because children who have been vaccinated against H influenzae type B and S pneumoniae are less likely to be infected with these pathogens. Immunosuppressed and sick children are susceptible to specific pathogens, e.g. children with cystic fibrosis are susceptible to *Pseudomonas*

infection. Mild signs and symptoms are often similar to those of a cold or flu, but they last longer.

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