"CLINICAL PROFILE OF COMMUNITY ACQUIRED PNEUMONIA IN ELDERLY"

By

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In partial fulfillment of the requirements for the degree of

DOCTOR OF MEDICINE

In

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Under the guidance of

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2017

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LIST OF ABBREVIATIONS USED

ABG	Arterial blood gas
ATS	American thoracic society
BUN	Blood urea nitrogen
CAP	Community acquired pneumonia
CCF	Congestive cardiac failure
COPD	Chronic obstructive pulmonary disease
CT	Computed tomography
DBP	Diastolic blood pressure
DM	Diabetes mellitus
ESR	Erythrocyte sedimentation rate
Hb	Hemoglobin
HIV	Human immunodeficiency virus
HTN	Hypertension
IDSA	Infectious diseases society of America
IHD	Ischemic heart disease
LFT	Liver function test
PR	Pulse rate
PSI	Pneumonia severity index
PTB	Pulmonary tuberculosis
RBS	Random blood sugar
RV	Residual volume
SBP	Systolic blood pressure
TC	Total leucocyte count
TLC	Total lung capacity
TVF	Tactile vocal fremitus

ABSTRACT

Clinical Profile Of Community Acquired Pneumonia in Elderly

INTRODUCTION:

Community acquired pneumonia (CAP) is 6th leading cause of death in older people. Elderly patients hospitalized with CAP constitute a special population since they commonly have comorbidities, nutritional & immunological deficits. CAP in this population has atypical presentation. Diagnosis & treatment poses challenge for clinicians.

Hence this study is undertaken to study clinical, radiological & bacterial profile of CAP in elderly.

MATERIALS & METHOD:

Patients diagnosed with CAP by clinical examination, radiology & sputum analysis were involved in a prospective study of 63 patients aged >60years from October 2014 to September 2016.

OBSERVATION:

Among 63 patients, males were 38(60%) & females 25(40%), predominantly between the age group 60-74years.

Diabetes mellitus 12(19%) and Anemia 12(19%) were seen to be most commonly associated comorbidity followed by Ischemic heart disease 11(17%). Patients presenting with atypical symptoms were 19(30%) included vomiting, pain abdomen, headache, giddiness and altered sensorium.

All 63 patients were not vaccinated.

Smoking was the commonest habit observed.

Staphylococcus aureus was commonly isolated organism in 13(21%) patients on sputum examination.

Left lower lobe 29(47%) was most commonly affected, then the right lower lobe 16(25%) on radiological findings.

The most common complication noted was acute kidney injury in 9(15%) followed by septicemia 7(11%), respiratory failure 7(11%) and pleural effusion 2(3%).

Overall mortality was 13%.

CONCLUSION:

CAP in elderly is a serious problem encountered in clinical practice. They have atypical clinical presentation other than typical respiratory symptoms of pneumonia.

Atypical presentation may lead to delayed diagnosis and initiation of treatment. Association of comorbidities results in slow recovery and higher mortality in elderly patients.

Key words: Community Acquired Pneumonia (CAP), Elderly.

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INTRODUCTION

Pneumonia is an inflammatory response in the lung caused by an infectious agent that involves alveoli and terminal bronchioles. It is manifested by increased weight of the lungs, replacement of normal lung sponginess by consolidation and alveoli filled with white blood cells, red blood cells and fibrin[1].

The clinician defines pneumonia as a combination of symptoms (fever, chills, cough, pleuritic chest pain, sputum) signs (hyper or hypothermia, increased respiratory rate, dullness to percuss, bronchial breathing, aegophony, crackles, wheeze, pleural friction, rub) and an opacity (opacities) on chest radiograph. In addition laboratory findings such as increased white blood cell count and decreased level of oxygen saturation[1].

Pneumonia is the sixth leading cause of death in older people in the United States[2]. About 600,000 persons with pneumonia are hospitalized each year, and there are 64 million days of restricted activity due to this illness[3]. The reported incidence rates of radiologically confirmed community acquired pneumonia in different populations varied between 1.3–11.6 cases per 1000 inhabitant - year with highest rates in elderly adults that is 13-15 cases per 1000 inhabitant-year. In developed countries almost one half of total hospitalization for pneumonia occur in patients over 65 years and pneumonia is a leading cause of death in this age group[4].

It is estimated that the age-specific incidence of pneumonia increases from 15.4 cases per 1000 in those aged 60 to 74 years, to 34.2 for those 75 years and older[5].

The mechanism by which pneumonia occurs is by three routes- hematogenous, airborne and microaspiration. The latter is most common. Hematogenous spread may occur in elderly patient, bacteremic from a urinary tract source with secondary seeding of lung[1].

Managing pneumonia in an elderly patient requires an appreciation of many aspects of geriatric medicine, including the demographics of our aging population[6].

The effect of pneumonia on the general health of an elderly person, and knowledge of how pneumonia in this population is different than in younger population need to be understood. Most patients who require hospitalization for the treatment of community-acquired pneumonia (CAP) are elderly. The elderly have impaired function of many organs by virtue of the aging process and as a result of comorbidity[7]. There are structural and functional alterations in old age, which impair the host's defense against pulmonary infection[8, 9].

It is an increasing problem among the elderly, who are particularly susceptible to this infection because of their impaired gag reflex, decreased mucociliary function, waning immunity, and various degrees of cardiopulmonary dysfunction[10].

Elderly patients hospitalized because of CAP constitute a special population, since they commonly have underlying illnesses, prior neurologic disturbances, nutritional and immunologic deficits.

CAP in this population has peculiar clinical characteristics. As stated by Sir William Osler, “In old age, pneumonia may be latent, coming on without chill, the cough and expectoration are slight, the physical signs ill defined and changeable, and the constitutional symptoms out of all proportion.” For instance, not all the signs and

symptoms of pneumonia are present in all cases. The clinical presentation may consist only of an alteration of the patient's general condition, confusion or decompensation of underlying disease[11].

Due to its high incidence and considerable morbidity and mortality, community-acquired pneumonia (CAP) in the elderly represents a very important public health problem. Despite the availability of adequate antimicrobial agents, CAP is still one of the main causes of death in this age group, with mortality rates ranging from 16 to 33%. Although age has been reported to be an independent risk factor for death in several studies analyzing outcome in CAP, age by itself is not the only factor giving rise to the high incidence and mortality rates of CAP in the elderly. Other associated factors often present in the elderly could also be involved[12].

Although data are available from a number of prospective studies and national databases, it is difficult to determine the clinical and economic impact of community acquired pneumonia (CAP) in European adults for a number of reasons. For example, only Finland, Spain and the UK have precise epidemiological data on CAP. Mortality attributable to CAP varies widely between European countries and with the site of patient management. The burden of CAP may be underestimated because a universally recognized definition of CAP is lacking. Other reasons include difficulties in obtaining samples for culture because of the lack of a productive cough and frequent use of antibiotics before diagnosis. Technical limitations of diagnostic tests may also prevent the accurate identification of a pathogen. This, in turn, may result in empiric treatment of outpatients with antibiotics. Given that most patients are treated on an outpatient basis and a substantial proportion of studies are based on hospitalized patients, the true extent of CAP is not known[13].

Pneumonia can be one of the cause of sudden deterioration of or a slow recovery from an existing primary disease in this group of patients.

Recovery is prolonged in the elderly, especially the frail elderly who may require up to several months to return to their baseline state of mobility. Indeed, hospitalization, with its enforced immobility, often hastens functional decline in the elderly; 25%-60% of older patients experience a loss of independent physical function while being treated in the hospital. Twenty one percent of those aged over 85 years need help with bathing and 10% need help in using the toilet and transferring. The presence of any or all of the following identifies elderly persons at greatest risk for functional decline: decubitus ulcer, cognitive impairment, functional impairment, and low level of social activity[11].

The increasing numbers of older patients hospitalized with CAP will consume a large percentage of health resources in the future. The increase in morbidity and mortality in the elderly and the considerable cost of treatment support, there is a need to prevent CAP with an effective vaccine. Pneumococcal capsular polysaccharide vaccines (PCV) based on antigens common to 7, 10 or 13 pneumococcal serotypes are currently licensed and in late stage clinical trials in adults. These vaccines may prevent a substantial proportion of the overall burden of CAP. Vaccination of young children may also aid in controlling antibiotic resistance in pneumococcal disease in Europe. Children are a reservoir for antibiotic resistant pneumococci and are the most vulnerable to pneumococcal infections. Vaccinating this age group with PCV may be an effective tool for preventing infections caused by drug resistant strains. In addition to preventing disease, vaccine induced immunity reduces transmission by preventing carriage, and subsequently may contain the spread of resistant strains[13].

The atypical clinical picture of CAP in the elderly may be associated with a delay in establishing the diagnosis and, consequently, in starting adequate antibiotic therapy. Delay in diagnosis and treatment may contribute to the higher observed death rate in the elderly population with CAP[14].

Although the bacteriological diagnosis and immunological status of the individual has explained the pathophysiology of pneumonia, the radiological recognition still continues to be the most important investigative tool for the diagnosis of pneumonia. The radiological type of pneumonia does give an important clue regarding clinical outcome of pneumonias.

Hence the following study was undertaken to study the clinical, radiological and bacteriological profile of community acquired pneumonia in elderly.

OBJECTIVES OF THE STUDY

1. To study the clinical profile of community acquired pneumonia in elderly.
2. To study the radiological presentation and bacteriological etiologies of community acquired pneumonia in elderly.

REVIEW OF LITERATURE

HISTORICAL ASPECTS OF PNEUMONIA

The history of pneumonia traces back to fourth century BC, when it was first described by the ancient Greek physician, Hippocrates, called as 'the father of medicine'. He named it 'peripneumonia'. At that time treatment included leeches, cupping, emetics, tonics and purges to draw away the inflammation from the chest wall, along with blood letting[15].

Maimonides (1138-1204) described the symptoms of pneumonia as acute fever, sticking chest pain, short rapid breaths, serrated pulse and cough[16]. This description is quite similar to those found in modern textbooks.

In 1834, Lanneac paved the way for the understanding of pathogenesis of pneumonia, by describing the three stages of consolidation as the stage of congestion, the stage of red hepatization and the stage of grey hepatization. Lanneac also perfected the use of stethoscope and described the 'Crepitous rattle' as the pathognomic sign of stage of congestion, red hepatization to be heralded by the development of bronchial breathing and resolution by return of crepitation called 'Rhonchus crepitus redux'[17].

Bacteria was first seen in the airways of individuals dying of pneumonia by Edwin Klebs[18].

The initial work identifying two common bacterial causes of pneumonia, streptococcus pneumonia and klebsiella pneumonia was performed by Carl Friedlander and Albert Frankel in 1882 and 1884 respectively. Friedlander introduced

the technique of gram staining, a fundamental test still used to identify and categories bacteria. Klebsiella pneumonia was named as Friedlander's bacillus[19].

Sir William Osler, the father of modern medicine, emphasized the mortality and morbidity of pneumonia and its association with old age and described it as 'the captain of men of death '. He also described it as 'friend of aged, releasing them from those cold gradations of decay, that make the last state of all so distressing[20].

In 1904, Baum described the entity of tuberculous pneumonia[21].

In 1976, there was an outbreak of respiratory illness in Philadelphia by legionella, and the disease was called as legionella pneumonia[22].

In 1986, Chlamydia pneumonia was described, which caused both sporadic and epidemic cases[23].

With the advent of penicillin, there was an improvement in the outcome of pneumonia in nineteenth century. With the modern diagnostic techniques, antibiotics and intensive care facilities, mortality from pneumonia dropped precipitously in developed countries by twentieth century.

The introduction of pneumococcal vaccine in 1977 also resulted in decline in pneumococcal pneumonia[24].

DEVELOPMENT OF THE LUNGS DEVELOPMENT OF THE AIRWAYS AND VESSELS:

Intrauterine development:

The lung appears first as an epithelial bud at the caudal end of the laryngotracheal groove on the 26th day after ovulation. It thus shares its origin with the foregut. This bud, derived from endoderm, will form the epithelium of the airways and of the acini. As it elongates, it becomes invested in mesenchyme derived from mesoderm, and this mesenchymal layer exerts control over its pattern of branching. The mesenchyme itself develops into the connective tissue, cartilage, smooth muscle and vessels of the lung.

In the first few weeks of development, nerve fibres arising from the ectoderm migrate into the mesenchyme to give the lung its motor and sensory connections.

The developing lung bud divides into two halves and elongates, growing caudally on either side of the oesophagus.

By about 33 days the trachea has become separated from the foregut, and pouches representing the five lobes are clearly apparent.

Subsequent dichotomous division leads to the development of the full adult complement of segments by 41 days and to completion of the bronchial tree as far as the terminal bronchioles by 16 weeks.

In utero, from 26 weeks to term, is occupied by the development and subdivision of the respiratory bronchioles and their saccules, with a variable amount of alveolar development, and by the growth of the airways[25].

Postnatal changes:

The most dramatic change in the lung occurs at the time of birth. Fetal breathing movements occur in utero and are known to be essential to normal lung development, but with the first postnatal breaths the lung inflates and resistance to flow in the pulmonary arteries falls; within a few days the pulmonary pressure has fallen to half systemic pressure.

Over the first few weeks the ductus arteriosus and foramen ovale have closed, the small muscular pulmonary arteries have dilated and their muscle coat thinned to adult dimensions, and the pulmonary arterial pressure has fallen almost to its adult level, which it eventually achieves at about 6 months[25].

ANATOMY OF LUNGS:

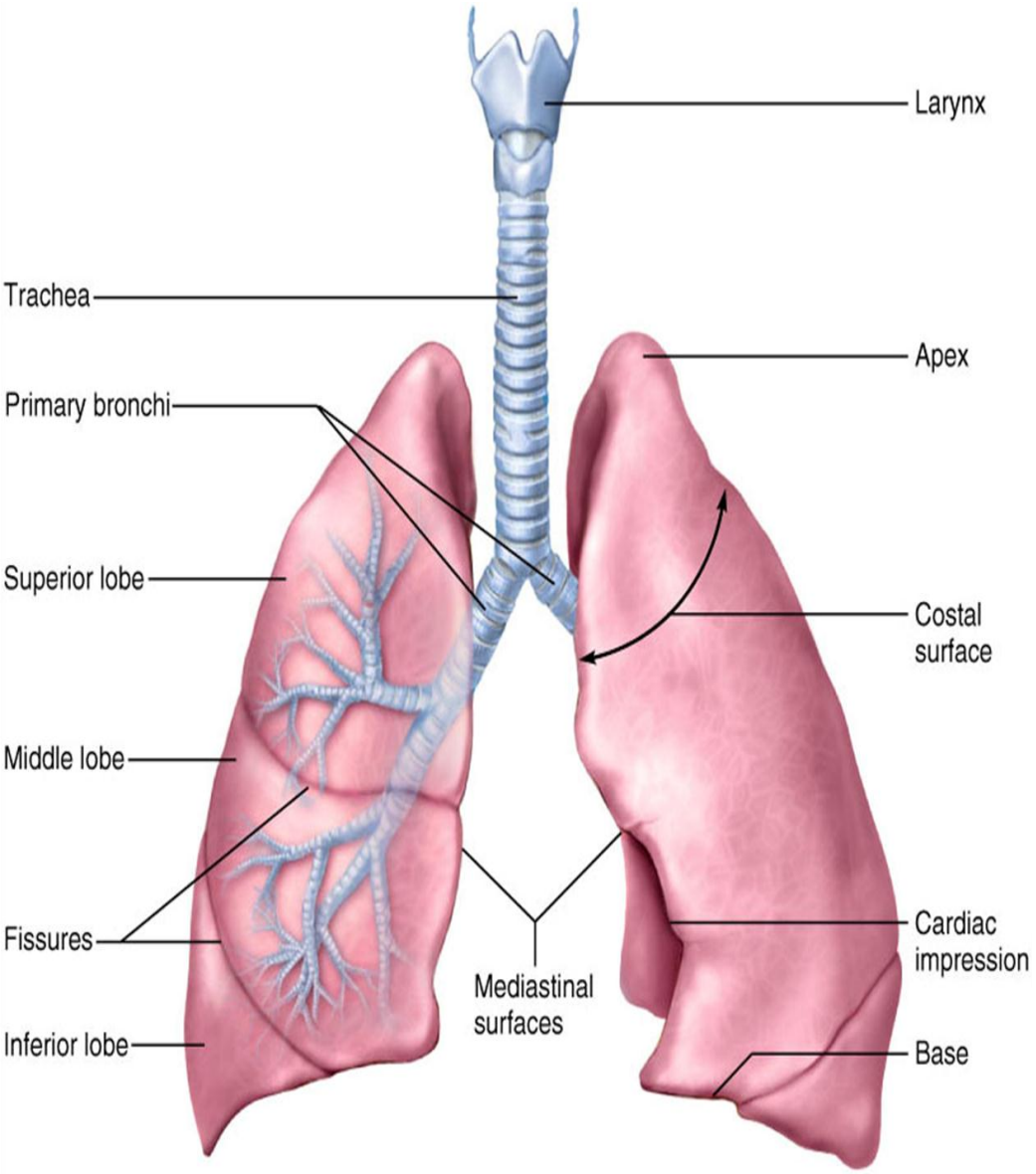
The lungs are ingeniously constructed to carry out their cardinal function of the exchange of gases between the inspired air and blood. The right lung has three lobes and the left lung has two lobes along with lingula.

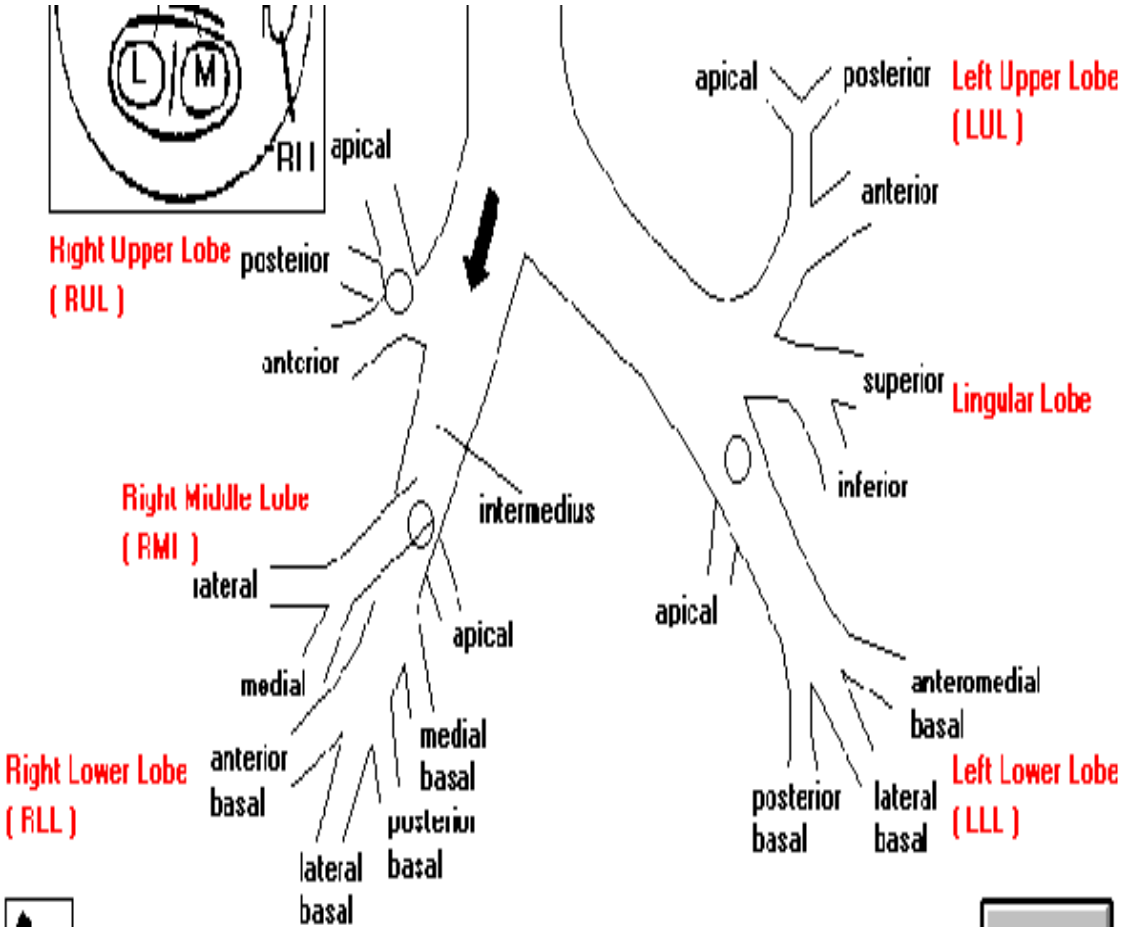
Each lobe is once again divided into bronchopulmonary segments, defined as area of lung tissue supplied by a given segmental bronchus.

Trachea divides into bronchi. Progressive branching of bronchi forms bronchioles, which are distinguished from the bronchi by the lack of cartilage and submucosal glands in their walls. Further branching of bronchioles leads to terminal bronchioles which are less than 2mm in diameter. The part of the lung distal to the terminal bronchiole is called the acinus, it is roughly spherical, with a diameter of about 7 mm. An acinus is composed of respiratory bronchioles, alveolar ducts and

alveolar sacs, the blind ends of the respiratory passages, whose walls are formed entirely of alveoli, which are the site of gaseous exchange. A cluster of three to five terminal bronchioles, each with its appended acinus, is referred to as the pulmonary lobule.

Accompanying the branching airways is the double blood supply to the lungs that includes the pulmonary and bronchial circulation and also the nerve supply.


Larynx
Trachea
Apex
Primary bronchi
Superior lobe
Costal surface
Middle lobe
Fissures
Cardiac impression
Mediastinal surfaces
Inferior lobe
Base


L
M
RII
apical
Right Upper Lobe
(RUL)
posterior
anterior
Right Middle Lobe
(RMI)
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Right Lower Lobe
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basal
intermedius
apical
apical
posterior
Left Upper Lobe
(LUL)
anterior
superior
Lingular Lobe
inferior
apical
anteromedial
basal
posterior
basal
lateral
basal
Left Lower Lobe
(LLL)

FUNCTIONS OF RESPIRATORY SYSTEM:

1. The respiratory system brings air into close relationship with the mixed venous blood, allowing tissue respiration by uptake of oxygen into the circulation and elimination of carbon dioxide.
2. Water balance.
3. The maintenance of pH.
4. Elimination of inhaled particles and organisms, filtration of particulate matter from the circulation.
5. Metabolism of certain drugs and enzymes.
6. They also serve as a vehicle for the administration of anaesthetic and other drugs[25].

DEFENSE SYSTEM OF THE RESPIRATORY SYSTEM:

Nasopharyngeal defenses: IgA protects against bacterial proliferation. Sneezing removes microbes from respiratory tract.

Glottic and cough reflexes: Protect against aspiration.

Mucociliary clearance system: The mucociliary escalator traps and removes the microbes from respiratory tract thus preventing them to reach alveoli from nasopharynx.

Alveolar macrophage: Removes microbes from alveoli.

IgG and IgM: Help to remove microbes from blood[26].

Nutritional immunity: Lactoferrin is secreted by the airway epithelium has direct bactericidal effects, acts by sequestering iron, depletes the environment of the bacterial nutrient[27].

AGING:

Aging is characterized by a failure to maintain homeostasis under conditions of physiologic stress and this failure is associated with a decrease in viability and an increase in vulnerability of individual[28].

Age related structural and functional changes in lungs:

Structural changes:

Changes seen in the large airways is a reduction in the number of glandular epithelial cells. This results in reduced production of protective mucus and thus impaired defense against respiratory infection.

Area of alveoli falls and the alveoli and alveoli ducts enlarge.

There is a deposition of amyloid in lung vasculature and alveolar septa.

Small airways suffer qualitative and quantitative changes in the supportive elastin and collagen with coiling and rupture of fibres and consequent dilatation of alveolar ducts and air spaces (so called senile emphysema) and the increased tendency of small airways to collapse during expiration.

These changes may be exacerbated by reduced mobility, often consequent upon acute illness like pneumonia, with reduction in deep breaths, hypoventilation of dependent zones, failure to clear dependent sputum, thus further risk of lower respiratory infection.

All the respiratory muscles are made up of type I(slow), type IIA(fast fatigue resistant) and type IIIB(fast fatiguable). The major age related change in the muscles is a reduction in the proportion of type IIA fibres with the consequent impairment of strength and endurance.

This is added up by the systemic and respiratory pathologies common in elderly.

Overall, “lack of fitness” that is deconditioning, will exacerbate age related changes.

Acute infections often cause muscle weakness due to toxemia.

Ossification of costal cartilages, loss of vertebral disc space, increased antero-posterior diameter and calcification of rib articulatory surfaces combine with muscle changes to produce impaired mobility of thoracic cage[28].

Functional changes:

Total lung capacity (TLC) is the volume of air within the respiratory system when a subject makes a maximum voluntary inspiratory effort. It is determined by the balance of forces between the maximally activated inspiratory muscles and the elastic recoil of the lung and chest wall[29].

The elastic recoil of the lung tissue decreases with aging, making the lungs easier to expand during a deep breath toward TLC. This reduction in the elastic recoil tends to increase TLC, however chest wall (rib cage) becomes stiffer with aging, so that a maximal inspiratory effort is not able to achieve a higher lung volume even though the lungs themselves have become easier to expand. Thus, TLC usually remains stable throughout the aging process.

The volume of air remaining in the lungs when subjects have exhaled as much air as possible is called residual volume (RV). Because lung elastic recoil decreases as a consequence of normal aging, the RV and RV/TLC increase from young adulthood to older age. An abnormally high RV/TLC is called hyperinflation, can often be seen on a chest X-ray and occurs in both asthma and chronic obstructive pulmonary disease (COPD)[29].

Vital capacity (VC) is the difference between the absolute lung volume at TLC and at RV and the amount of air that a person can slowly exhale after inhaling maximally. Because TLC is relatively constant while RV increases with the age, the VC decreases with the age.

Effects of aging on lung functions:

- Lower maximal expiratory flows: FEV1, FEV1/FVC, FEF 75%
- Increased FRC and RV, lower VC, but stable TLC
- Lower diffusing capacity
- Lower PO2 and SPO2 as a consequence of V/Q mismatch (but no change in PCO2)
- Lower respiratory muscle strength and endurance
- Stiffer chest wall
- Increased lung tissue compliance (loss of lung recoil)
- Reduced respiratory drive (for hypoxia, hypercarbia and resistive loads)
- Increased airway reactivity (but no change in bronchodilator responsiveness)[29].

DEFINITION:

The Infectious Diseases Society of America (IDSA) defines CAP as "an acute infection of the pulmonary parenchyma that is associated with at least some symptoms of acute infection, accompanied by the presence of an acute infiltrate on a chest radiograph or auscultatory findings consistent with pneumonia (such as altered breath sounds and/or localized rales), in a patient not hospitalized or residing in a long-term care facility for more than 14 days before onset of symptoms"[30].

CLASSIFICATION OF PNEUMONIA[31]

I. Morbid anatomist's classification

- Lobar pneumonia
- Segmental pneumonia
- Sub-segmental pneumonia
- Bronchopneumonia

II. Empiricist's classification

- Community-acquired pneumonia
- Hospital-acquired (nosocomial) pneumonia
- Aspiration pneumonia
- Immuno-compromised host pneumonia

III. Behaviourist's classification

- Easy pneumonia (responds to initial treatment)
- Difficult pneumonia (fails to do so)

IV. Microbiologist's classification

1. Bacterial and related pneumonias

More common:

1. Pneumococcal pneumonia
2. Streptococcus pneumoniae
3. Atypical pneumonia:
    - Legionella spp. (legionnaires')
    - Mycoplasma pneumoniae

- Chlamydia spp.
- Coxiella burnetii (Q fever)

4. Staphylococcal pneumonia
5. Staphylococcus aureus
6. Gram-negative enteric pneumonia
    - Klebsiella spp.
    - Pseudomonas aeruginosa
    - Escherichia coli
    - Enterobacter spp.
    - Serratia spp.
    - Haemophilus influenza pneumonia
    - Moraxella catarrhalis pneumonia

7. Anaerobic pneumonia (mixed flora):
    - Bacteroides spp.
    - Fusobacterium spp.
    - Peptococcus spp.
    - Peptostreptoccus spp.

8. Mycobacterial pneumonia: Mycobacterium tuberculosis.

Less common/rare

- Pasteurella multocida
- Streptococcus pyogenes
- Neisseria meningitidis
- Brucella spp.
- Francisella tularensis (tularaemia)

- Rickettsial pneumonias
- Salmonella spp.
- Leptospiral pneumonia
- Listerial pneumonia
- Pseudomonas pseudomallei (melioidosis)
- Pseudomonas mallei (glanders)
- Yersinia pestis (pneumonic plague)
- Bacillus anthracis (inhalational anthrax)
- Actinomycotic and nocardial pneumonia

2. Non-bacterial pneumonia.

Viral pneumonia:

- Influenza
- Measles
- Adenoviruses
- Varicella
- Cytomegalovirus
- Respiratory syncytial virus
- Parainfluenza virus
- Corona viruses
- Coxsackie virus
- Rhinoviruses
- Epstein–Barr virus
- Herpes simplex virus
- Hanta virus, etc.

Bacteria-like and rickettsia-like pneumonia

Fungal and actinomycotic pneumonia

Parasitic pneumonia

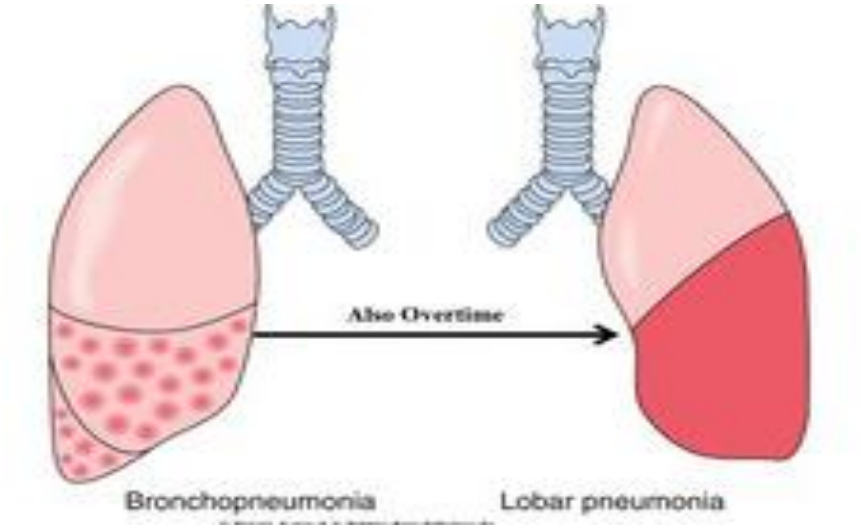
Chemical pneumonia, e.g. lipoid pneumonia

Physical pneumonia, e.g. ionizing radiation.

The anatomical terms used to indicate whether the pneumonia involves one or more entire lobes or whether the process is confined to a segment or segments. In its most confined form, pneumonia may be sub-segmental. Such anatomical descriptions are entirely dependent upon the chest radiographic appearances, which show the extent of pneumonia more accurately than can be gauged by physical examination.

Bronchopneumonia- Bronchopneumonia was regarded as a complication of bronchitis, in which the patchy inflammatory process was confined to the territory of small or terminal bronchi and the lung lobules subtended by them, hence the alternative term 'lobular pneumonia'. Bronchopneumonia therefore tends to be multifocal and the pathologist commonly finds it to be bilateral and often basal[31].

Lobar pneumonia- Lobar pneumonia, was characterized by an inflammatory outpouring or exudation of fluid extending throughout most of a lobe or lobes and frequently occurred de novo in a previously healthy lung. It is common place for the term 'lobar pneumonia' to be used when there is clinical and radiographic evidence of confluent consolidation occupying the greater part of one or more lobes of one or both lungs[31].



Segmental pneumonia- The term ‘segmental pneumonia’ is used when such consolidation is not extensive enough to occupy most of a lobe but corresponds more closely to the anatomy of a bronchopulmonary segment in one or more lobes.

Sub-segmental pneumonia- The term ‘sub-segmental pneumonia’ is a descriptive term used, when the area of radiographic shadowing is even more confined although this still implies a confluent and localized process, where sub-segmental shadowing is patchy (non-confluent) and poorly localized, being scattered throughout part or the whole of one or both lungs.

This anatomical classification is complementary but subservient to a causal classification and is of only limited value in establishing the likely infective agent, for although lobar pneumonia is usually caused by Streptococcus pneumoniae, it can be caused by many other microorganisms besides, as indeed can all other anatomical types. Therefore it is necessary to identity the pathogenic organism responsible for pneumonia in each patient in order that specific antimicrobial therapy can be directed against it.

It is useful in this respect to classify the case community acquired or hospital acquired (nosocomial) pneumonia. The spectrum of infecting organisms in these two groups vary, partly because the bacterial flora of hospital population has been modified as a result of their stay as well as those whose immune defenses are compromised by old age, severe underlying diseases or suppressed by drugs.

Nosocomial pneumonia is a particular problem in postoperative patients and in those treated in intensive care units, the latter group being highly susceptible to lower respiratory tract infection. The different lung pathogens found in hospitals result from the alteration in bacterial flora caused by the use of antibiotics and also often from the instrumentation or intubation of the upper airways of patients, which provides the organisms with easy access to the lungs. Such hospital-acquired infections are more frequently due to aerobic Gram-negative bacilli and Staphylococcus aureus (increasingly methicillin resistant) compared with those acquired in the community. It is not uncommon for multiple organisms to be simultaneously involved in a single patient in intensive care units[31].

PATHOGENESIS:

Pneumonia is predisposed by any of the following conditions that,

1. Reduces or suppresses the cough.
2. Impairs mucociliary activity.
3. Reduces the effective phagocytic activity of alveolar macrophages and neutrophils.
4. Impairs immunoglobulin production.

Potential pathogens reach the lung to cause pneumonia chiefly by microaspiration of secretions containing oropharyngeal flora but also by overt aspiration, by inhalation from environment, from a nebulizer or anesthetic circuit and by blood spread.

Colonial organisms in an already diseased lower respiratory tract may also spread directly to cause pneumonia in previously unaffected lung. Sometimes pathogens may spread directly from an adjacent extrapulmonary site of infection, such as the mediastinum, spine, chest wall or abdominal cavity.

Aspiration and Microaspiration:

Aspiration of small amounts of oropharyngeal contents is known to occur in healthy people during sleep. This tendency is increased by states in which the ability to cough is depressed, such as in old age, following surgery, general anesthesia, tracheostomy, or the passage of an endotracheal or nasogastric tube.

The intrinsic defenses of the lungs may be unable to cope with the inoculums if it contains particularly pathogenic organisms. Favourable conditions for infection

may also be provided by chemical injury to the lungs resulting from overt gastric acid aspiration or by pulmonary oedema and alcoholism is an important predisposing factor.

Many of the organisms that cause lower respiratory tract infections may exist commensally in the oropharynx. These include Streptococcus pneumoniae, Haemophilus influenzae, Staphylococcus aureus and anaerobic bacteria, to name but a few.

The oropharygeal flora in hospital patients is often altered, with the presence of Gram-negative bacilli, hence the increased incidence of pneumonia caused by these organisms in such patients.

Elderly persons harbour a higher proportion of Gram-negative organisms in the oropharynx, so that this type of pneumonia tends to be more common in old patients. It is also possible that mucosal ageing increases the ability of Gram-negative bacteria to attack the epithelial surface.

Inhalation:

The inhalation of microbes contained in small particle aerosols is important in the transmission of viral infections and also in Legionella pneumonia. The inhalation of infected particles from animals may be responsible for psittacosis and Coxiella pneumonia (Q fever).

Patient-to-patient spread may occur by both direct contact (via fomites) and droplet spread. Pathogens may also be introduced to the lower respiratory tract by contaminated nebulizer circuits or other respiratory equipment, this route can be avoided by proper preventive measures[31].

Colonization:

The lower respiratory tracts of patients with pre-existing lung diseases, such as chronic bronchitis, emphysema, bronchiectasis and cystic fibrosis, may become colonized by potentially pathogenic organisms, which may cause acute exacerbations of infection, including pneumonic consolidation, from time to time[31].

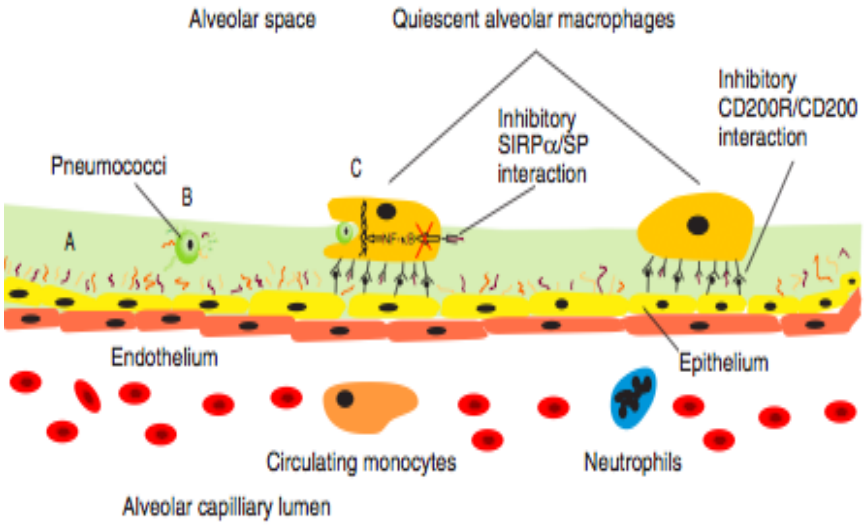
Blood spread:

Pneumonia may result from the haematogenous spread of bacteria from a focus of infection elsewhere. This may occur with Gram-negative and staphylococcal bacteremia. Patients with intravenous cannula, temporary pacing wires and those receiving chronic haemodialysis are susceptible for this[31].

PATHOLOGY[32]:

A healthy alveolar epithelium is vital to the maintenance of innate immune homeostasis in the lung. Alveolar lining fluid is nutritionally barren and replete with antimicrobial compounds. Bacteria are lysed by secreted innate factors such as lysozyme, phospholipase A2 and surfactant proteins. Induction of an anti inflammatory phenotype occurs in alveolar macrophages. Phagocytic functions are maintained but the ability to present antigen and secrete pro-inflammatory cytokines is suppressed by surfactant proteins, interleukin-10 and transforming growth factor, CD200, nuclear factor.

Pneumolysin and the other products breach the integrity of cell walls releasing intracellular components, some of them are damage associated molecular patterns. Macrophages recognize the bacteria via Toll like receptor-2 and platelet activating factor receptor interacts with bacterial cell wall constituents. The neutrophils get activated and are recruited and translocated across the endothelium and epithelium into the alveolar lumen. Macrophages present antigen to dendritic cells and migrate to regional lymph nodes[32].



PATHOLOGY OF LOBAR PNEUMONIA[33]:

In lobar pneumonia, there are four stages of inflammatory response;

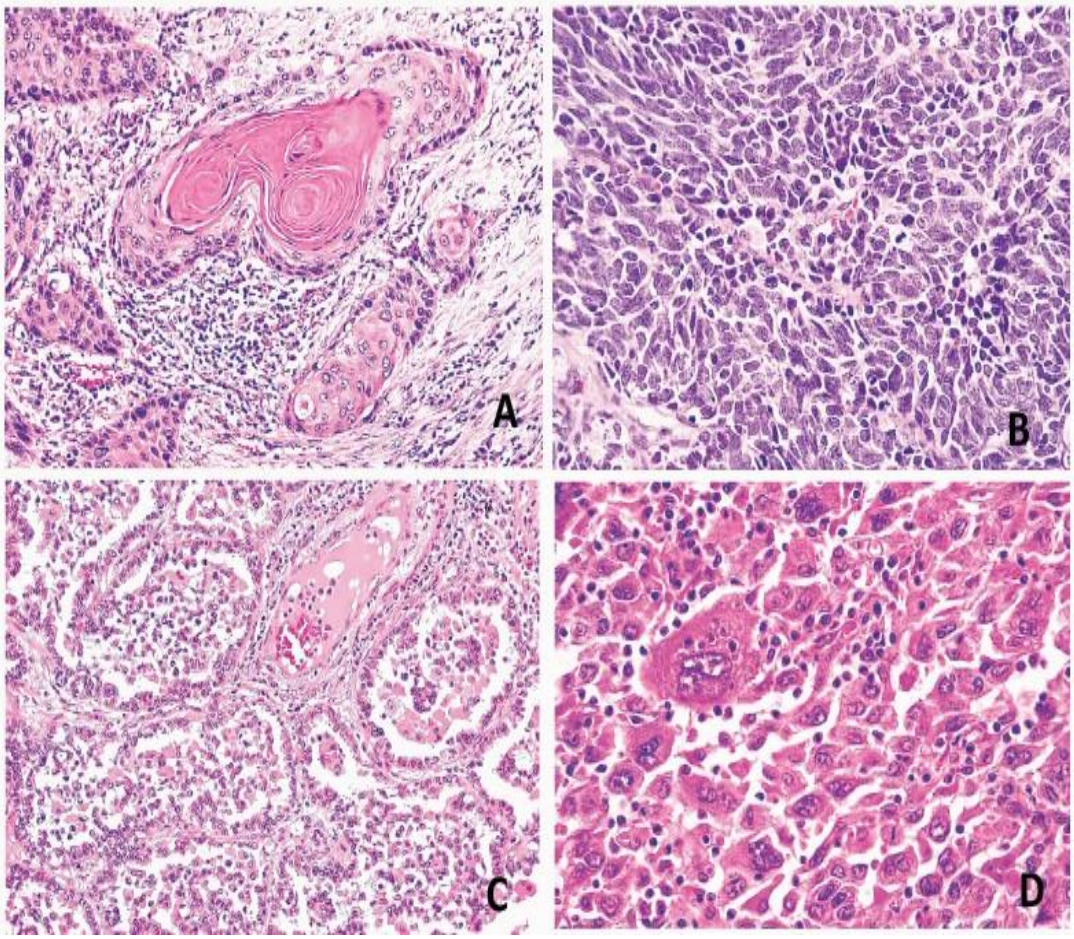
A) **The stage of congestion** – In this stage, lung is heavy, boggy and red. It is characterized by vascular enlargement, intra-alveolar fluid is filled with few neutrophils and often the presence of numerous bacteria.

B) **The stage of red hepatization** – characterized by massive confluent exudation with red blood cells, neutrophils and fibrin filling the alveolar spaces. On gross examination, the lobe appears distinctly red, firm and airless with a liver like consistency, hence the term hepatization.

C) **The stage of grey hepatization** - characterized by progressive disintegration of red blood cells and the persistence of fibrinosuppurative exudates, giving the gross appearance of grayish brown, dry surface.

D) **The stage of resolution** – characterized by progressive enzymatic digestion of the consolidated exudates within the alveolar spaces, to produce a granular semifluid debris that is reabsorbed, ingested by macrophages, coughed up or organized by the fibroblasts growing into them[33].

Pathology of pneumonia:



Pathology of Bronchopneumonia

Bronchopneumonia is characterized by foci of consolidated areas of acute suppurative inflammation. Well developed lesions are usually 3 to 4 cm in diameter, slightly elevated, dry, granular, grey red to yellow and poorly delinated at their margins. Histologically, the reaction usually elicits a suppurative, neutrophil rich exudates that fills the bronchi, bronchioles and the alveolar spaces.

INVESTIGATIONS IN COMMUNITY ACQUIRED PNEUMONIA:

Sputum microscopy

Laboratory examination of expectorated sputum remains the most commonly requested microbiological investigation in suspected lower respiratory tract infections.

It remains useful, provided that samples are properly collected and promptly examined. The adequacy of an expectorated sample may be judged microscopically by the number of buccal epithelial cells present. Thus if 10 or more buccal squamous epithelial cells are noted per low power field, the specimen is likely to be salivary and unsuitable for culture.

Conversely, more than 25 neutrophils per low-power field indicate the presence of inflammation, although this may not apply to immunosuppressed patients. Similarly, a leucocyte to squamous epithelial cell ratio of greater than 5 may also be taken to indicate an adequate sputum sample rather than a salivary one.

Gram's stain may be helpful in identifying the cause when large numbers of one predominant type of organism are found in association with evidence of inflammation. Less clear evidence of infection than the foregoing has to be interpreted cautiously since commensal organisms are likely to be picked up by sputum as it passes through the oropharynx[31].

Gram staining appearences of commonly isolated organism are as follows;

1. Gram-positive lancet shaped diplococci suggest Streptococcus pneumoniae,
2. Gram-positive cocci in clusters may be seen in Staph. Aureus,
3. Tiny Gram-negative coccobacilli suggest H.influenzae

4. Numerous intracellular Gram-negative diplococci imply Moraxella (Branhamella) catarrhalis infection
5. Larger Gram-negative bacilli suggest Klebsiella pneumonia or other enteric pathogens.
6. The absence of large numbers of organisms in an adequate sputum sample raises the possibility of Legionella pneumophila, Mycoplasma pneumoniae, Coxiella burnetii or a viral pneumonia.

The application of routine Gram staining to sputum is an area of controversy, some experienced clinicians using it, others not. The possibility of tuberculosis should never be forgotten and an acid-fast smear using either carbolfuchsin (Ziehl–Nielsen) or fluorochrome (auramine) should be requested when the chest radiographic appearances are compatible[31].

Sputum immunodetection:

Other tests sometimes applied to sputum include pneumococcal antigen detection by one of a number of possible methods, including latex agglutination, counter immuno electrophoresis (CIE), coagglutination or the Quellung reaction[34, 35].

Legionella pneumophila is one of a number of organisms that may be detected rapidly in respiratory secretions by the direct immunofluorescent antibody test (DFAT). The specificity of this test for this organism is about 94% but the sensitivity is low at 50%[36].

Specific fluorescein-labelled monoclonal antibodies using the DFAT technique may also be used to detect Chlamydia pneumoniae in sputum and also Pneumocystis carinii in bronchoalveolar lavage fluid or induced sputum. An

advantage of these tests is that their sensitivity is not reduced by the prior use of antibiotics[36].

Sputum culture:

The usefulness of standard sputum culture is limited by the delay, usually at least 24 hours between submission the specimen and receipt of a result. Culture also suffers from the same potential problem of contamination by oropharyngeal flora as does microscopy. Furthermore, pathogens that were identified on the Gram stain may not grow in culture because of the prior use of antibiotics, which clearly reduces the sensitivity of culture techniques. Where sputum samples have been found to be microscopically adequate (i.e. <10 epithelial cells and >25 neutrophils per low-power field), comparability with the positive yield obtained from transtracheal aspiration. The sensitivity of sputum culture for pneumococci is about 50%[37].

The finding of Escherichia coli or Proteus spp., often reported as 'coliforms', usually implies an altered oropharyngeal flora as a result of antibiotic usage.

Pseudomonas aeruginosa and H. influenzae may similarly colonize such lungs. Legionella spp. may be cultured on a selective charcoal yeast extract medium, if the patient is sufficiently ill to cause anxiety or if there are other grounds to suspect this organism. Although culture of Legionella spp. is slower, it is more sensitive than DFAT and species other than L. pneumophila may be grown.

The microscopic and culture findings in sputum obtained by suction devices from patients who have an endotracheal or tracheostomy tube in situ are less reliable because the trachea rapidly becomes colonized by Gram negative organisms once the tube has been placed and these organisms need not be representative of infection in the lung itself[31].

Invasive methods for obtaining respiratory secretions:

Other methods for obtaining respiratory secretions are more invasive and may be associated with morbidity. Their use is therefore confined to patients who are severely ill and in whom it is considered important to identify the organisms rather than relying on an initial empirical antimicrobial approach or in whom such an approach has already been tried and failed. It has been shown that these severe infections may be polymicrobial and that the mortality is almost doubled.

Transtracheal aspiration:

May be carried out in patients in such cases, who are unable to raise sputum or in whom the response to the chosen antibiotics is poor[38]. The success of the procedure relies on the assumption that the tracheobronchial tree below the larynx is sterile, but false positive results occur in patients with chronic lung disease because of tracheobronchial colonization[39]. The technique has also been applied when anaerobic lung infection is suspected.

Fibreoptic bronchoscopy:

Picks up the oropharyngeal contaminants unless special precautions are taken using a protected specimen brush (PSB). The PSB may be combined with or used separately from bronchoalveolar lavage (BAL) to obtain quantitative cultures in order to discriminate between the presence and absence of pneumonia, usually on ventilated patients in an intensive care setting.

Bronchoalveolar lavage: (BAL)

BAL subtends a wide area of tissue and lung secretions are diluted between 10 and 100-fold, so that when interpreting results a threshold of 104 or 105cfu/mL may be taken. By combining PSB and BAL and by counting intracellular organisms, Chastre and colleagues claimed a sensitivity of 100% (compared with 86% for either technique alone) and a specificity of 96%[40].

Percutaneous **ultra-thin needle lung aspiration** without fluoroscopic guidance has been found to obtain a positive culture.

These invasive techniques have mainly been used in research settings and their wider clinical role remains undecided and somewhat controversial[41, 42]. The bronchoscopic option in immune-competent patients may be appropriated once they have reached the stage of intubation and mechanical ventilation. A simpler option in the intubated and ventilated patient is the quantitative culture of endotracheal aspirates.

Transbronchial, thoracoscopic or open lung biopsies:

These tend to be reserved for diffuse pulmonary infiltrates of undetermined cause and in the context of suspected infection, are occasionally carried out in sick immuno-compromised hosts including transplant recipients, those receiving chemotherapy for lymphoma and in patients with AIDS, in whom the presence of an unusual opportunist pathogen is likely and in whom less invasive diagnostic approaches like BAL have failed to identify the cause[43, 44].

Blood culture:

It is normal practice to carry out blood culture on all patients admitted to hospital with suspected pneumonia since a positive culture may occur in 10–30% of cases, the higher percentage applying to pneumococcal pneumonia. This provides definitive proof (i.e. high specificity) of a pathogenic organism, often lacking where sputum culture and other tests are concerned and is also of prognostic importance because bacteremia, is a marker of a more severe infection.

Pneumococcal antigen detection:

Pneumococcal antigen detection using latex agglutination (sputum, blood) or less commonly, CIE (sputum, urine, blood) is carried out routinely in some centers but is impractical for all patients, being usually reserved for those who are severely ill.

Standard acute and convalescent serological testing:

The usual serological tests involve the measurement of complement-fixing antibody levels in the blood, although more sensitive enzyme-linked immunosorbent assay (ELISA) and immunofluorescent tests are tending to replace them. Serological tests may be used for infections caused by Mycoplasma pneumoniae, Chlamydia spp., Coxiella burnetii and Legionella spp. By its nature, the complement fixation test (CFT) is seldom of immediate value and when positive usually provides diagnostic information retrospectively, as two paired samples are required in order to demonstrate a fourfold rise or fall in the titre of specific antibodies[45].

Newer microbiological technologies:

The tantalizing promise of new methods for the rapid detection and identification of specific organisms using molecular genetic techniques seems close to being fulfilled but for most laboratories and clinicians has yet to be delivered, largely because of financial constraints.

DNA probes have been developed for characterizing target organisms and minute amounts of target DNA can be amplified by the polymerase chain reaction (PCR) to improve the chance of their detection by the DNA probe so that the sensitivity of the test is increased.

A PCR assay has recently been tested on the serum of patients with bacteremic pneumococcal pneumonia and was found to have a sensitivity of 100% and a specificity of 94%[46].

Similar probes have been or are being developed for a wide range of organisms including Legionella pneumophila, Mycoplasma pneumoniae, Neisseria meningitidis, Blastomyces dermatitidis, Histoplasma capsulatum, Coccidioides immitis, Mycobacterium tuberculosis, Mycobacterium avium complex and Mycobacterium kansasi.

Pleural fluid analysis:

If a pleural effusion is present in a patient suspected of having pneumonia, it should always be examined to exclude an empyema. Some biochemical findings (low pH, high lactate dehydrogenase, low glucose) have been used to predict which parapneumonic effusions may be likely to develop into empyemas[31].

Chest radiography:

A chest radiograph provides an immediate visual impression of the extent of involvement. It is emphasized that almost every causative agent can produce a wide variety of different radiographic appearances, so that it is unwise to assume that a confluent lobar pneumonia is bound to be caused by Streptococcus pneumoniae despite the probability that this is the case. Similarly, cavitation need not be due to Staph. aureus pneumonia but may occur in necrotizing Gram-negative pneumonias, such as those caused by Klebsiella pneumoniae, or pneumonia arising from the aspiration of anaerobic bacteria or even from infection with Strep. pneumoniae when serotype 3 is involved.

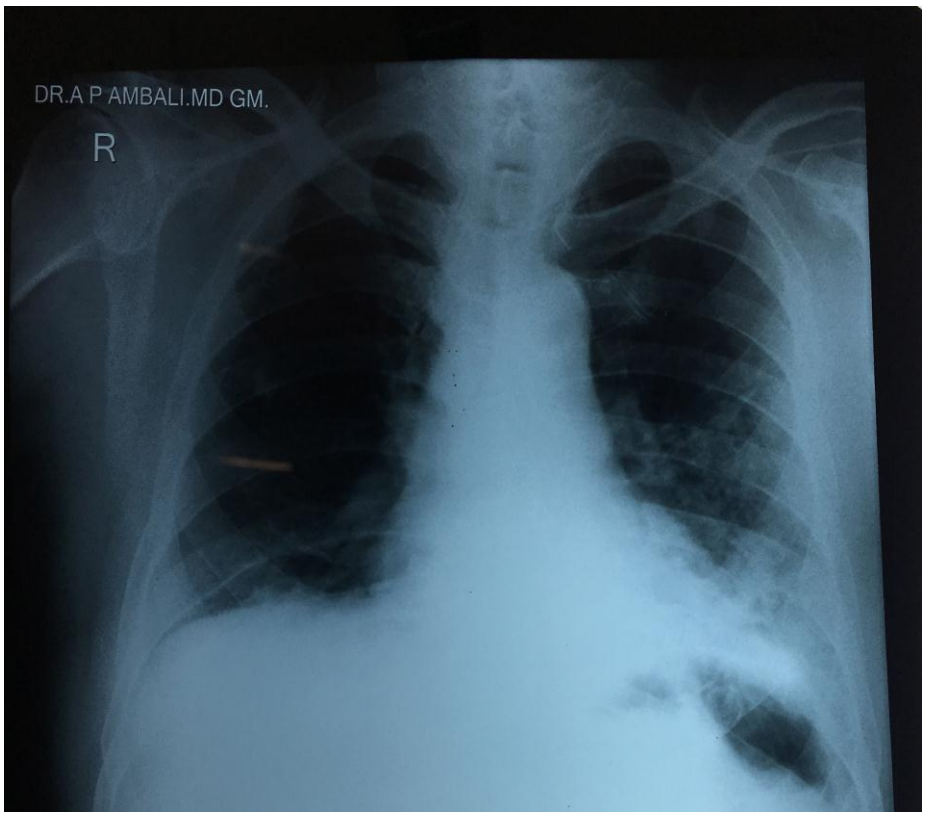
Radiographic response to treatment usually lags well behind clinical improvement and pneumococcal pneumonia may take 6 weeks to clear on the chest film.

Persistent, recurrent or worsening shadowing may indicate either inappropriate treatment or bronchial obstruction by a foreign body or more commonly, tumor particularly in patients over the age of 60 years[31].

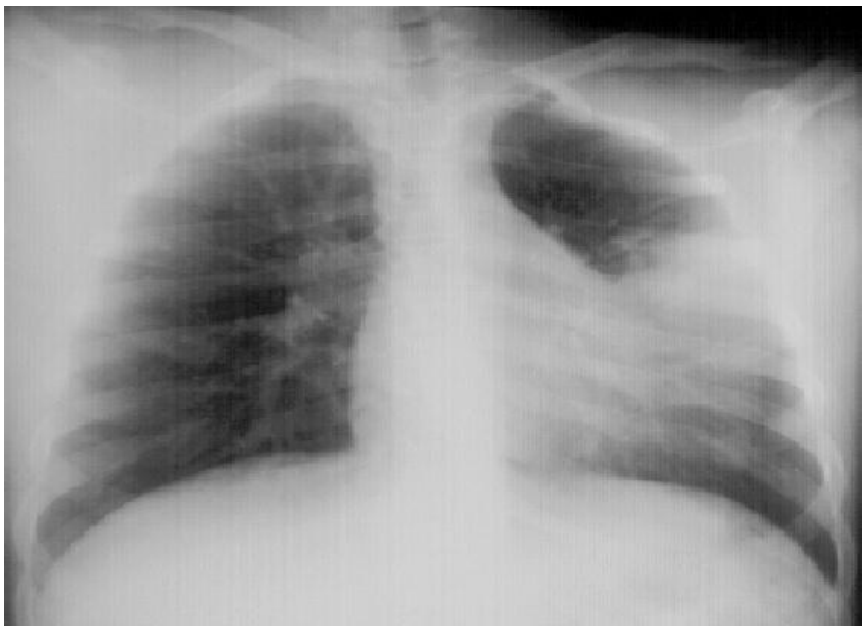
Computerised tomography CT:

CT provides a higher resolution than chest xray along with recognition of necrotizing pneumonia, cavities, minimal pleural effusions.

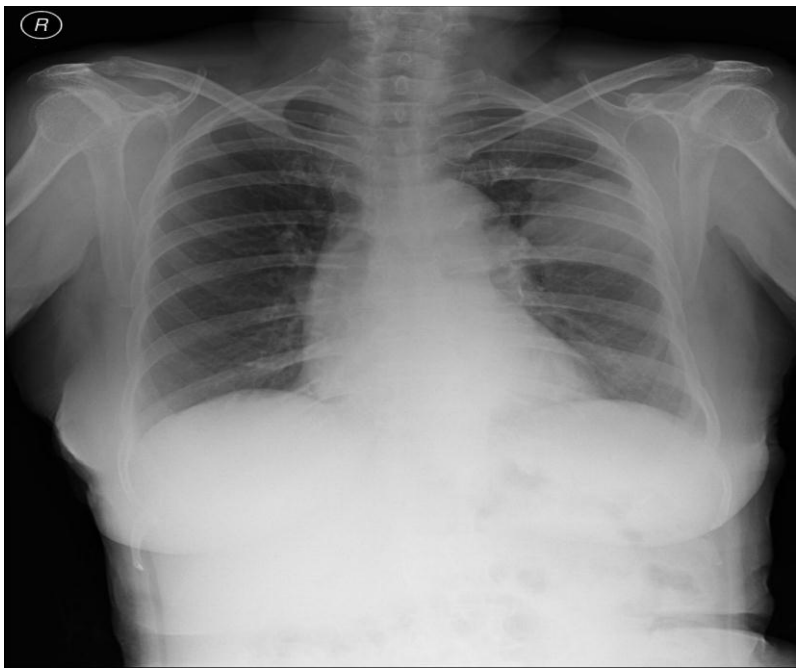
Left lower lobe pneumonia:



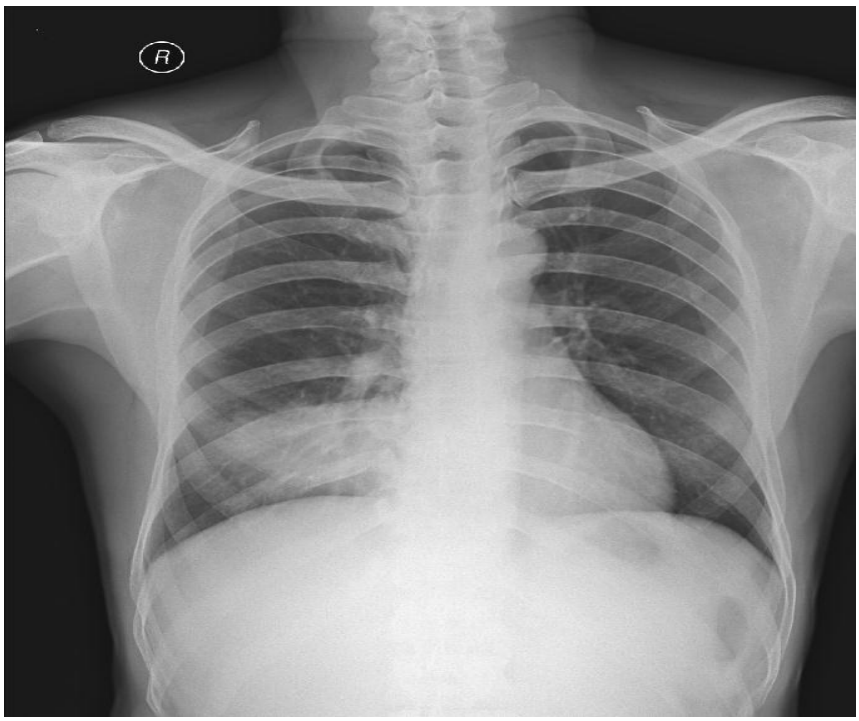
Lingular pneumonia:



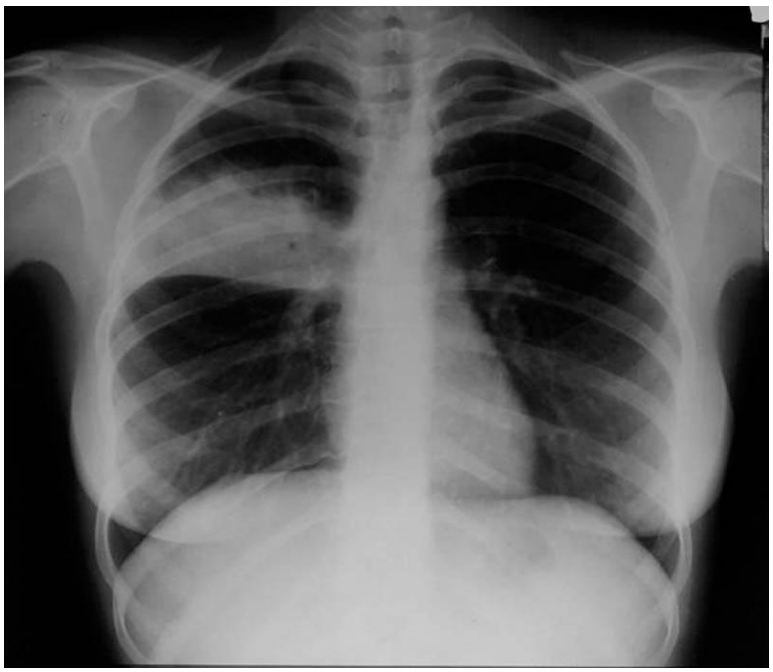
Left upper lobe pneumonia



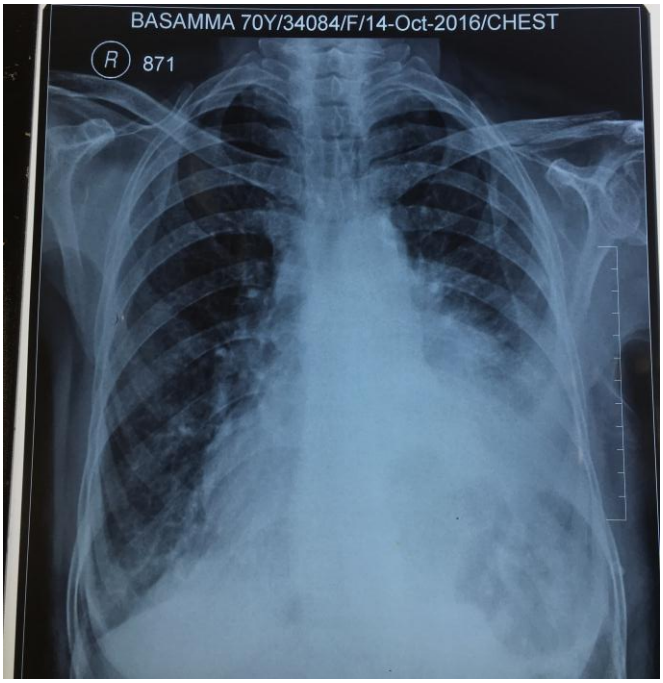
Right lower lobe pneumonia:



Right middle lobe pneumonia:



Synpneumonic effusion:



CLINICAL FEATURES:

Cough with/without expectoration

Fever with/without chills

Hemoptysis

Breathlessness

Chestpain

Atypical: Nausea, Vomiting, Pain abdomen, Backache, Headache, Giddiness, Confusion, Altered behavior.

Clinical features may differ depending upon the different causative organisms, like,

Streptococcus pneumoniae

The incidence peaks in the winter and rainy season, when carrier rates in the general population may be as high as 70%. It is most common in infants, elderly, alcoholic and immunocompromised patients. Of the elderly with bacteremic pneumonia, 30% do not have fever and 50% have minimal respiratory symptoms. Classically Streptococcus pneumoniae has a very abrupt onset that begins with acute febrile illness. The onset of the illness is frequently preceded by mild coryza or other upper respiratory tract symptoms. patient remains febrile with continuous fever, typically 38.5-39.50C, for between 5 and 10 day. pleuritic chest pain is common as it frequently involves peripheral lung and spreads quickly to the pleura. The sputum is usually yellowish or greenish in colour, sometimes containing flecks of blood.

On physical examination the patient may be sweating, flushed and ill looking. Fever with concomitant tachycardia is present. Tachypnea is usually present as breathing may be limited in depth by pleuritic pain. An impaired percussion note over the affected lobe may be elicited. The breath sounds are usually tubular bronchial breathing over the same area associated with increased vocal fremitus and vocal resonance, aegophony and whispering pectoriloquy. Localized crepts may be heard[47].

Haemophilus influenzae

The onset of symptoms tends to be more insidious than that seen with S. pneumoniae, but the clinical pictures are otherwise indistinguishable. Pneumonia is detected in the lower lobes more often than in the upper lobes.

Staphylococcus aureus

Staphylococcus aureus pneumonia is more likely to occur in patients with severe diabetes mellitus or an immuno-compromised state, in patients receiving dialysis, in drug abusers, and in those with influenza or measles. The clinical manifestations of this infection are similar to other forms of bacterial pneumonia. However the illness is often severe, being associated with high fever and a slow response to conventional therapy.

Pseudomonas aeruginosa

Pseudomonas pneumonia results in microabscess, alveolar haemorrhage, and necrotic areas. Some cases of pseudomonas pneumonia are associated with bacteraemia. The infection may be fulminating in bacteraemic cases and may result in septic shock with hypotension and oliguria and patient may develop ARDS.

Klebsiella pneumoniae

The clinical syndrome produced in Klebsiella pneumonia may be indistinguishable from that produced by many other acute bacterial pneumonias, except that the infection tends to be severe. As with staphylococcal pneumonia, cavitation and abscess formation may occur, although these tend to be less widespread. The sputum is viscid and may be blood-stained, like redcurrant jelly.

Anaerobic Bacteria

Bacteroides melaninogenicus, Fusobacterium nucleatum, anaerobic cocci, and anaerobic streptococci are responsible for most cases of anaerobic pneumonia. Common factors responsible for aspiration of anaerobes include altered consciousness, tooth extraction, poor dental hygiene, oropharyngeal infections, and drug overdose. More than 50% of patients have foul-smelling sputum, along with other features of pneumonia[47].

Community-Acquired "Atypical" Pneumonia

Organisms causing atypical community-acquired pneumonia include Legionella pneumophila, Mycoplasma pneumoniae, Chlamydia psittaci, Chlamydia pneumoniae, Coxiella burnetii, and Francisella tularensis. In atypical pneumonia, the chest x ray abnormalities are often disproportionate to the pulmonary symptoms, and sputum analysis may reveal numerous leukocytes and no organisms. A significant overlap occurs in the clinical manifestations of this group of infections, usually not associated with production of sputum.

Legionella pneumophila

Clinical features include high fever, cough, myalgias, and shortness of breath. As compared with other bacterial pneumonias, cough usually produces only small amounts of sputum. Gastrointestinal symptoms, confusion, and headache are more frequently encountered in patients with Legionella. Symptoms, in decreasing order of frequency, are abrupt onset of cough (hemoptysis in 30% of patients), chills, dyspnea, headache, myalgia, arthralgia, diarrhoea, and relative bradycardia and change in mental status. Laboratory findings are similar to other acute pneumonias. The only distinctive finding may be hyponatremia.

Chlamydia pneumoniae

It is a cause of atypical pneumonia. Person-to-person spread occurs among school children, family members, and military recruits. The disease occurs sporadically and presents in a manner similar to Mycoplasma, with sore throat, hoarseness and headache in addition to a non-productive cough, Pharyngeal erythema and wheezing are common[47].

RISK FACTORS FOR COMMUNITY ACQUIRED PNEUMONIA:

1. Chronic obstructive pulmonary disease (COPD)
2. Diabetes mellitus
3. Renal insufficiency
4. Congestive heart failure (CHF)
5. Coronary artery disease
6. Malignancy
7. Chronic neurologic disease
8. Chronic liver disease.
9. Beta lactam therapy within the past 3 months
10. Immunosuppression (either as the result of an illness or induced by treatment with corticosteroids),
11. Alcoholism

RISK FACTORS AND PREDICTORS OF OUTCOME. Predisposing factors for pneumonia in elderly[48]

- Age greater than 65 years
- Enhanced oropharyngeal colonisation
- Macroaspiration and microaspiration
- Impaired mucociliary transport
- Impairment of cough reflex
- Defects in host defence mechanism
- Poor nutrition
- Institutionalisation
- Recent hospitalization
- Endotracheal or nasogastric intubation
- Recent surgery
- Smoking.

Coexisting illnesses: Persons with certain coexisting illnesses have an increased incidence of CAP. These illnesses include, chronic obstructive pulmonary disease(COPD), diabetes mellitus, renal insufficiency, congestive heart failure(CHF), coronary artery disease, malignancy, chronic neurologic disease and Chronic liver disease[48].

Risk factors for pneumococcal Pneumonia - dementia, seizures, congestive heart failure, cerebrovascular disease, and chronic obstructive lung disease.

Risk factors for Streptococcus pneumonia - Patients with previous use of b-lactam antibiotics, alcoholism, immunosuppression, and residence in a nursing home.

Risk factors for legionnaires disease include male sex, tobacco smoking, diabetes, hematologic malignancy, cancer, end-stage renal disease, and HIV infection.

Risk factors for enteric gram-negative organisms: recent antibiotic therapy, underlying cardiopulmonary disease, residence in a nursing home, and multiple medical comorbidities.

Risk factors for P aeruginosa: structural lung disease such as bronchiectasis, broad-spectrum antibiotic therapy that lasted for at least 7 days in the past month, corticosteroid therapy with at least 10 mg of prednisone per day, and malnutrition[47].

Host factors - Host factors that also have had a major impact on the epidemiology of pneumonia are an increase in the number of immunosuppressed individuals living in the community and the marked increase in the number of those of advanced age.

Environmental factors. There is a clear seasonal variation in the rate of pneumonia; both attack rates and mortality rates are highest in the winter months. This is likely due to an interaction between viruses such as influenza virus and S. pneumoniae, and confinement indoors. The healthy, retired elderly travel a lot and thus may develop, for example, legionnaires disease while on a cruise ship, due to exposure to a contaminated decorative water fountain.

THE BIG DECISION: HOSPITAL OR HOME?[49]

Reasons for the admission of low-mortality-risk patients fall into 4 categories:

(1) Complications of the pneumonia itself

(2) Exacerbation of underlying diseases

(3) Inability to reliably take oral medications or receive outpatient care

(4) Multiple risk factors.

Inpatient treatment of pneumonia is approximately 25 times more expensive per patient than outpatient treatment, and most patients are more comfortable in a home environment.

The more common tendency is overestimation of disease severity, which leads to hospitalization of patients at low risk for death or serious complications. Although no firm guidelines exist regarding hospital admission, several well-recognized risk factors are associated with an increased risk of death or a complicated clinical course.

It is becoming more common practice for many hospitals and managed care systems to use some type of scoring system to assist with decisions regarding hospitalization for patients who have pneumonia[49].

ICU ADMISSION DECISION:

- Direct admission to an ICU is required for patients with septic shock requiring vasopressors or with acute respiratory failure requiring intubation and mechanical ventilation.
- Direct admission to an ICU or high-level monitoring unit is recommended for patients with 3 of the minor criteria OR 2 major criteria for severe CAP listed in in criteria for severity of pneumonia below[50].

The two prominent tools for this purpose are the pneumonia severity index (PSI), CURB-65 rule.

Pneumonia severity index: PSI:

Patient Characteristics:	**Points**
Demographics:	
Age (years): Male: Age, Female: Age	-
Nursing home resident	+10
Comorbidities:	
Neoplastic disease	+30
Liver disease	+20
Congenital heart disease	+10
Cerebrovascular disease	+10
Renal disease	+10
Examination findings:	
Altered mental status	+20
Respiratory rate >30/minute	+20
Systolic blood pressure <90mmhg	+20
Temperature $<35^0$C	+15
Pulse >125/minute	+10
Laboratory findings:	
pH <7.35 (ABG only if patient is hypoxic or COPD)	+30
BUN >10.7 mmol/L	+20
Sodium <130mEq/L	+20
Glucose	+10
Hematocrit <0.30	+10
PaO_2 <60mmHg or oxygen saturation <90%	+10
Pleural effusion	+30

Risk	**Class**	**Score**
Low	I	<51
Low	II	51-70
Low	III	71-90
Medium	IV	90-130
High	V	>130

Pneumonia severity index PSI: [51, 52, 53]

CURB-65 Severity Score:

Clinical Factor	Points
Confusion	1
Blood urea nitrogen >19 mg per dl	1
Respiratory rate >30 breaths per minute	1
Systolic blood pressure <90mmHg or Diastolic blood pressure <60mmHg	1
Age ≥ 65years	1

Recommendations	CURB-65 score
Low risk, consider home treatment	0
	1
Short inpatient hospitalization or closely supervised outpatient treatment	2
Severe pneumonia; hospital and consider admitting to intensive care unit	3
	≥ 4

CURB 65 scoring: [51, 52, 53]

The patients with a CURB- 65 score of 0–1 be treated as outpatients, that those with a score of 2 be admitted to the wards, and that patients with a score of 3 often required ICU care.

CRITERIA FOR SEVERE COMMUNITY ACQUIRED PNEUMONIA[50]

Minor criteria

- Respiratory rate > 30 breaths/min
- PaO2/FiO2 ratio < 250
- Multilobar infiltrates
- Confusion/disorientation
- Uremia (BUN level > 20 mg/dL)
- Leukopenia (WBC count < 4000 cells/mm3)
- Thrombocytopenia (platelet count < 100,000 cells/mm3)
- Hypothermia (core temperature < 36^0C)
- Hypotension requiring aggressive fluid resuscitation

Major criteria

- Invasive mechanical ventilation
- Septic shock with the need for vasopressors

COMPLICATIONS OF PNEUMONIA IN ELDERLY PATIENTS [26]

Respiratory

- Nonresolving pneumonia
- Bronchiectasis
- Synpneumonic effusion
- Empyema
- Respiratory failure
- Pulmonary embolism

Nonrespiratory

- Bacteremia
- Metastatic infection like septic arthritis, endocarditis
- Septic shock
- Multisystem organ dysfunction

PREVENTION:

Prevention of CAP infection is mainly with the use of a US Food and Drug Administration approved pneumococcal vaccine and influenza vaccine.

Pneumococcal capsular polysaccharide vaccine[54]

It is about 60% effective in preventing bacteremia in immunocompetent adults with pneumococcal infections. The vaccine should be given routinely to patients older than 65 years and to all patients with asplenia. The vaccine is also recommended for patients aged 64 years or younger if they have certain coexisting illnesses. Revaccination is recommended for patients older than 65 years who initially received the vaccine more than 5 years earlier and the initial vaccine was administered at age less than 65 years. If the initial vaccine was given at age greater than 65 years, then repeated vaccination is not indicated. The Infectious Diseases Society of America (IDSA) states that patients can be given the pneumococcal vaccine immediately after an episode of pneumonia.

Influenza vaccine[55]

This vaccine is advised in all persons older than 65 years, patients with chronic medical illness and those who provide health care to patients at risk of complicated influenza. These preparations are revised annually to account for antigenic drift that occur each season, thus has to be given yearly. Efficacy approaches 70% to 90% in young. For older persons the efficacy is less, but still attenuates the infection, decreases the number of lower respiratory tract infections and morbidity and mortality associated with influenza infection.

MANAGEMENT: [56]

The American Thoracic Society (ATS) stratifies patients into four groups based on the absence or presence of two cardiopulmonary diseases (COPD and CHF), the modifying risk factors and the site of treatment (eg, outpatient setting, General medical ward, Intensive care unit).

Outpatient Treatment

Group I- No cardiopulmonary disease (CPD), no modifying factors (MFs): Macrolide OR Doxycycline.

Group II- CPD or MFs- Beta-lactam plus either a Macrolide or Doxycycline OR Fluoroquinolone antibiotic alone.

Hospitalized Patients on General Medical Wards

Group IIIA- CPD or MFs intravenously administered (IV) Beta-lactam plus either a Macrolide or Doxycycline OR Fluoroquinolone antibiotic alone.

Group IIIB- No CPD or MFs IV Azithromycin alone (or Beta-lactam plus Doxycycline for Azithromycin-hypersensitive patients) OR Fluoroquinolone antibiotic alone.

Hospitalized Patients in Intensive Care Unit

Group IVA- No risk factor for Pseudomonas infection IV Beta-lactam plus either IV azithromycin or IV fluoroquinolone antibiotic.

Group IVB- Risk factor for Pseudomonas infection. IV antipseudomonal Beta-lactam plus IV antipseudomonal Fluoroquinolone antibiotic OR IV antipseudomonal Beta-lactam plus IV Aminoglycoside plus either IV Azithromycin or IV Fluoroquinolone antibiotic (Aztreonam plus Aminoglycoside plus IV antipseudomonal fluoroquinolone antibiotic for Beta-lactam–hypersensitive patients)

MATERIALS AND METHODS

The present study was conducted at BLDEU's Shri B M Patil Medical College, hospital and Research Centre, Vijayapura. This study is a prospective study carried out on 63 cases of community acquired pneumonia of patients aged > 60 years from October 2014 to September 2016. Prior to the study, the protocol was approved by the institutional ethical committee and information was collected through prepared proforma from each patient. All patients were interviewed as per the prepared proforma and then complete clinical examination and laboratory findings were analyzed.

Inclusion Criteria

1. Age > 60yrs, irrespective of sex.
2. Clinical symptoms like fever, cough with or without expectoration, pleuritic chest pain, dyspnea and altered sensorium.
3. Clinical Signs like tachypnea, reduced chest movements, dull percussion note, bronchial breath sounds, increased vocal fremitus and vocal resonance and crepitations.
4. Radiological evidence of pneumonia without any clinical evidence of pneumonia will also be included.

Exclusion Criteria

1. Active pulmonary tuberculosis
2. Lung malignancies

Patient demographic features were recorded according to a standard questionnaire. A detailed clinical history was taken. History for comorbid illness and habits like smoking and alcoholism, tobacco chewing were taken. Comorbid illnesses were defined as the presence of co-existing cardiac failure, ischemic heart disease,

chronic lung disease, chronic liver disease, chronic renal disease, cancer, neurological diseases and diabetes mellitus. A detailed clinical examination was carried out including general physical examination, vital signs and respiratory system examination, mainly for signs of consolidation and other systemic examination for the comorbid illness. Routine investigations were sent. Radiological evaluation was done. Sputum was collected for Gram stain, ZN stain and culture and sensitivity, before starting empirical antibiotic therapy.

TYPE OF STUDY

Prospective study

SAMPLE SIZE:

95% level of confidence and expected prevalence of pneumonia in elderly individuals is 1.5 % with the minimum sample size with the minimum sample size with +/-3% margin error is 63. The formula used in the calculation is

$$n = \frac{z^2 p(1-p)}{d^2}$$

where,

z= 1.96 at 95% level of confidence

p= Prevalance

d= Margin of error

STATISTICAL METHODS:

These may include,

1. Mean ± SD (Standard Deviation)
2. Graphical presentation
3. X2 test of association
4. Student t test

INVESTIGATIONS:

Complete Blood Count

Urine Routine

Sputum microscopy for Gram stain, AFB

Sputum culture and sensitivity

Chest Xray PA view

ECG

RBS

Serum Creatinine

RFT

LFT

CT Chest (if done)

Bronchoscopy (if done)

Arterial blood gas analysis (if done)

RESULTS

The present study was conducted at BLDEU's Shri. B. M. Patil Medical College, hospital and Research Centre, Vijayapura.. This study is a prospective study carried out on 63 cases of community acquired pneumonia patients aged > 60 years. A detailed history was taken, clinical parameters on admission were noted, routine investigations, chest x ray and sputum examination were carried out on all patients. The results and observations of the study are as follows.

AGE & GENDER DISTRIBUTION

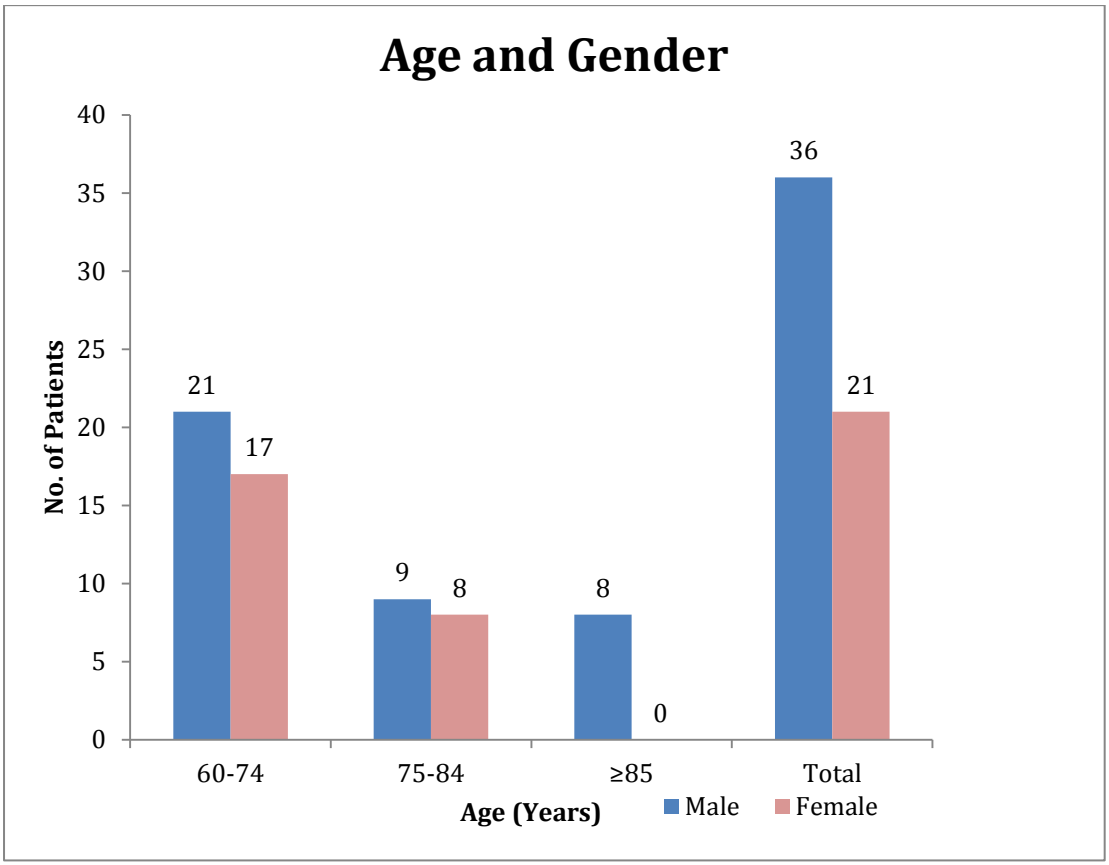
In this study, the age group of patients varied from 60 to 99 years. Mean age was 71.14 years. Majority of patients were in the age group 60 - 74 years. Out of 63 patients, 38(60%) were males and 25(40%) were females. The detailed age distribution is shown in the table 1 and bar diagram 1

Table: 1

Distribution according to Age and Gender

Age/ Gender	Male	Percentages	Female	Percentages	Total	Percentages
60-74	21	55	17	68	38	60
75-84	09	24	8	32	17	27
≥85	08	21	0	0	08	13
Total	38 (60%)		25 (40%)		63	

Diagram 1:



CHIEF COMPLAINTS:

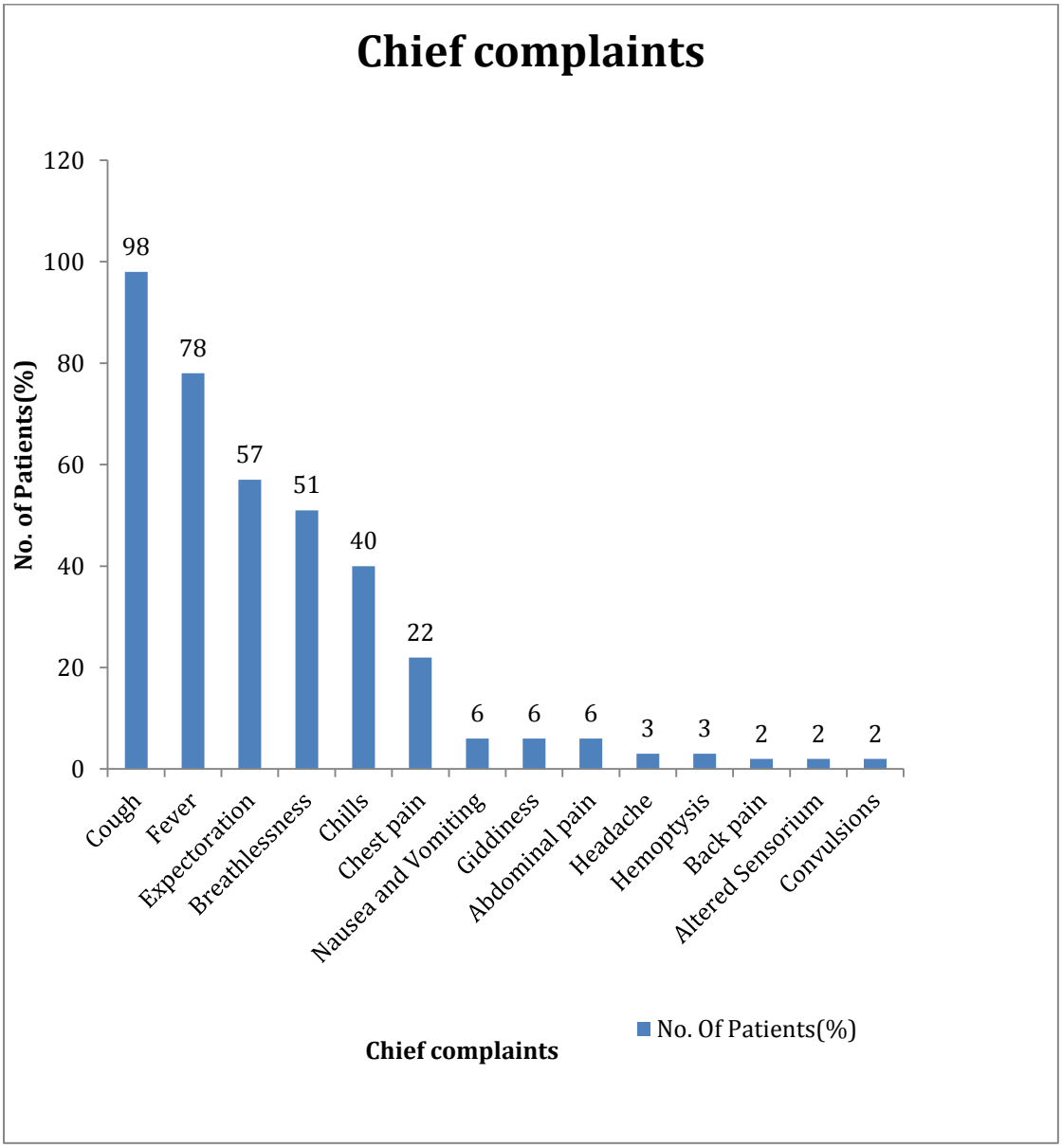
In this study patients presented with both typical and atypical symptoms. Among the typical respiratory symptoms, cough was predominant and was present in 62(98%) patients, expectoration in 36(57%) patients, fever in 49(78%) patients, chills in 25(40%), breathlessness in 32(51%), chest pain in 14(22%), hemoptysis in 2(3%) patients. Among the atypical symptoms, gastrointestinal symptoms of nausea, vomiting or diarrhea in 4(6%), abdominal pain in 4(6%) patients, back pain in 1(2%), neurological symptoms like giddiness in 4(6%), headache in 2(3%), altered sensorium was present in 1(2%), convulsions in 1(2%) patients. The details of chief complaints is shown in table 2 and bar diagram 2,

Table 2

Distribution according to complaints (n=63)

Complaints	No. of patients	Percentage (%)
TYPICAL		
Cough	62	98
Fever	49	78
Expectoration	36	57
Breathlessness	32	51
Chills	25	40
Chest pain	14	22
ATYPICAL		
Nausea and Vomiting	04	6
Giddiness	04	6
Abdominal pain	04	6
Headache	02	3
Hemoptysis	02	3
Back pain	01	2
Altered Sensorium	01	2
Convulsions	01	2

Diagram 2:


Chief complaints
120
100
80
60
40
20
0
No. of Patients(%)
98
78
57
51
40
22
6
6
6
3
3
2
2
2
Cough
Fever
Expectoration
Breathlessness
Chills
Chest pain
Nausea and Vomiting
Giddiness
Abdominal pain
Headache
Hemoptysis
Back pain
Altered Sensorium
Convulsions
Chief complaints
No. Of Patients(%)

COMORBID CONDITIONS:

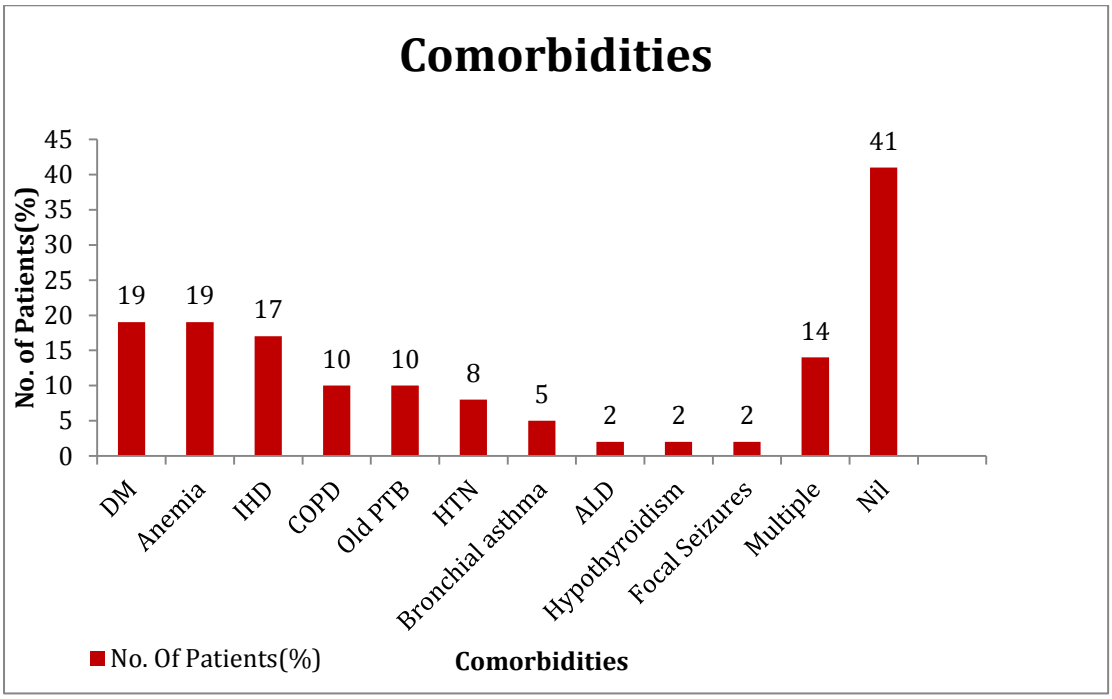
Among the comorbid conditions, Diabetes mellitus and Anemia were the most common, noted in 12(19%) patients. Other comorbidities noted were Ischemic heart disease in 11(17%) patients, Chronic obstructive pulmonary disease in 6(10%), old pulmonary tuberculosis in 6(10%) patients, Hypertension in 5(8%) patients, Asthma 3(5%), Hypothyroidism in 1(2%), Focal seizures in 1(2%), Alcoholic liver disease in 1(2%) patient. Multiple comorbidities were noted in 9(14%) patients. This is depicted in table 3 and bar diagram 3.

Table 3

Distribution according to Comorbidities

Comorbidities	**No. of Patients**	**Percentage (%)**
DM	12	19
Anemia	12	19
IHD	11	17
COPD	6	10
Old PTB	6	10
HTN	5	8
Asthma	3	5
ALD	1	2
Hypothyroidism	1	2
Focal Seizures	01	2
Multiple	09	14
Nil	26	41

Diagram: 3



DM: Diabetes Mellitus, IHD: Ischemic heart disease, COPD: Chronic obstructive pulmonary disease, PTB: Pulmonary tuberculosis, HTN: Hypertension, ALD: Alcoholic liver disease

DISTRIBUTION ACCORDING TO HABITS:

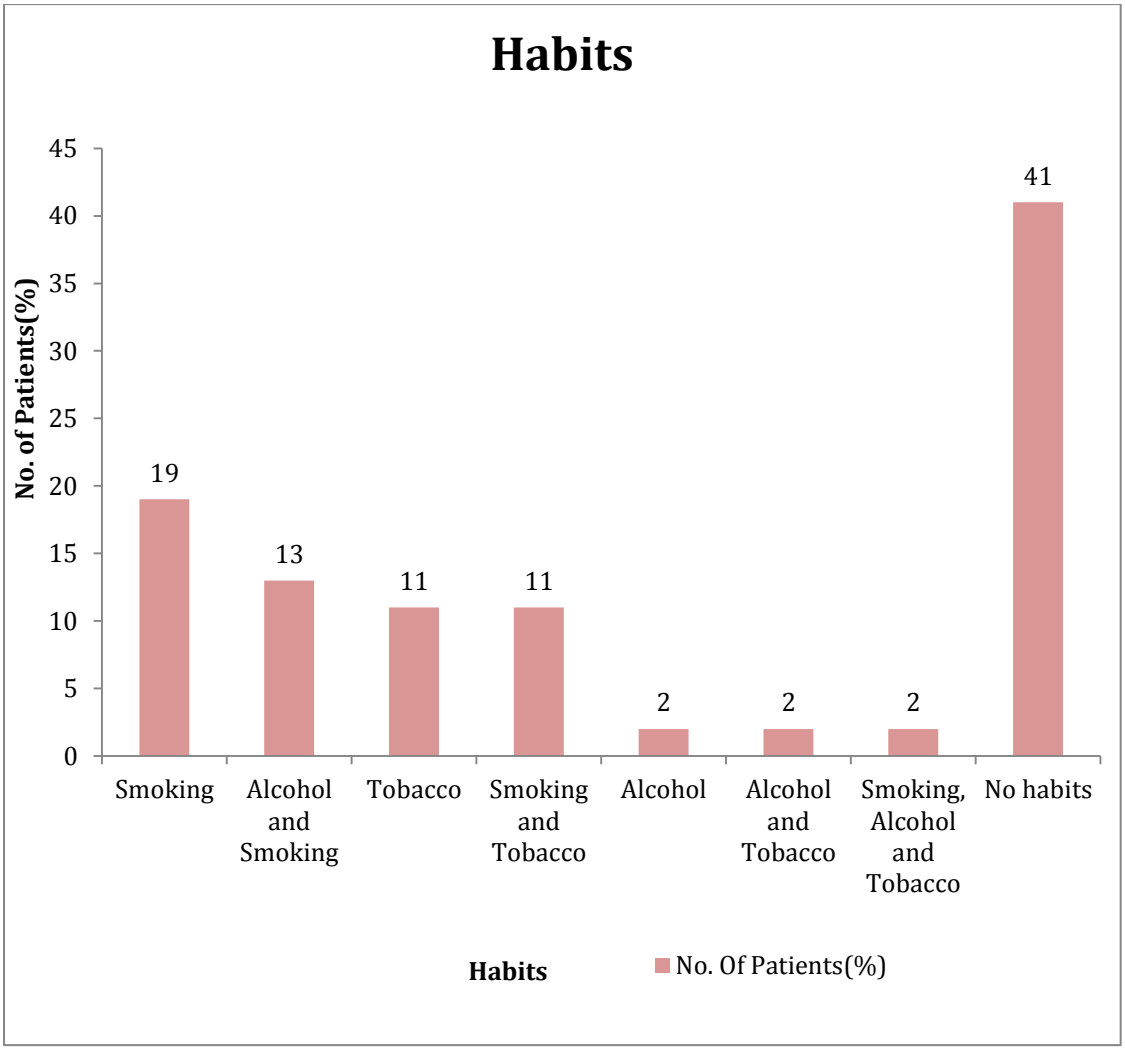
Among habits, smoking was predominant and was noted in 12(19%) patients, tobacco chewing in 7(11%), alcohol consumption in 1(2%) patients. Multiple habits like alcohol consumption and smoking were noted in 8(13%), smoking and tobacco chewing in 7(11%), alcohol consumption and tobacco chewing in 1(2%) and smoking, alcohol consumption, tobacco chewing, all the three habits were noted in 1(2%) patients. Among 63 patients, 26(41%) patients had no habits. This is depicted in table 4 and diagram 4 below,

Table 4:

Distribution according to Habits

Habits	No. of Patients	Percentage (%)
Smoking	12	19
Alcohol consumption and Smoking	8	13
Tobacco	7	11
Smoking and Tobacco	7	11
Alcohol consumption	1	2
Alcohol consumption and Tobacco	1	2
Smoking, Alcohol consumption and Tobacco	1	2
No habits	26	41
Total	63	100

Diagram:4


Habits
No. of Patients(%)
45
40
35
30
25
20
15
10
5
0
19
13
11
11
2
2
2
41
Smoking
Alcohol and Smoking
Tobacco
Smoking and Tobacco
Alcohol
Alcohol and Tobacco
Smoking, Alcohol and Tobacco
No habits
Habits
No. Of Patients(%)

IMMUNIZATION:

All the patients 63(100%) in this study were not immunized with pneumococcal and influenza vaccines, shown in table 5.

Table 5

Distribution according to Immunization

Immunization	No. of Patients	Percentage (%)
No Immunization	63	100
Total	63	100

VITAL SIGNS:

In this study, tachycardia defined as pulse rate >100/min was noted in 19(30%) patients, Hypotension defined as systolic blood pressure <100 mmHg was noted in 9(14%) and diastolic blood pressure defined as <70mmhg was noted in 12(19%) patients, tachypnea defined by respiratory rate >16/min was noted in 43(68%) patients, and increased temperature defined as temperature $<37^0$C was noted in 38(60%) patients. It is depicted in Table 6.

The mean pulse rate was 94.14 beats per minute, systolic blood pressure was 117.62mmHg, diastolic blood pressure was 71.81mmHg, respiratory rate was 21.49 cycles per minute, temperature was 37.46^0C, shown in Table 7.

Table 6

Vitals	No. of patients	Percentage (%)
PR		
60-100	44	70
>100	19	30
SBP		
<100	09	14
100-140	46	73
>140	08	13
DBP		
<70	12	19
70-90	48	76
>90	03	05
RR		
12-16	20	32
>16	43	68
Temperature		
35.8-37	25	40
>37	38	60
Total	63	100

Table 7

Vitals	N	Minimum	Maximum	Mean	Std. Deviation
Age	63	60	99	71.14	9.831
PR	63	74	120	94.14	11.333
SBP	63	80.00	200.00	117.6190	23.29573
DBP	63	50.00	110.00	71.8095	11.43122
RR	63	12	44	21.49	6.811
Temp	63	36	39	37.46	0.841

PR: Pulse Rate, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, RR: Respiratory rate, Temp: Temperature

Diagram: 5

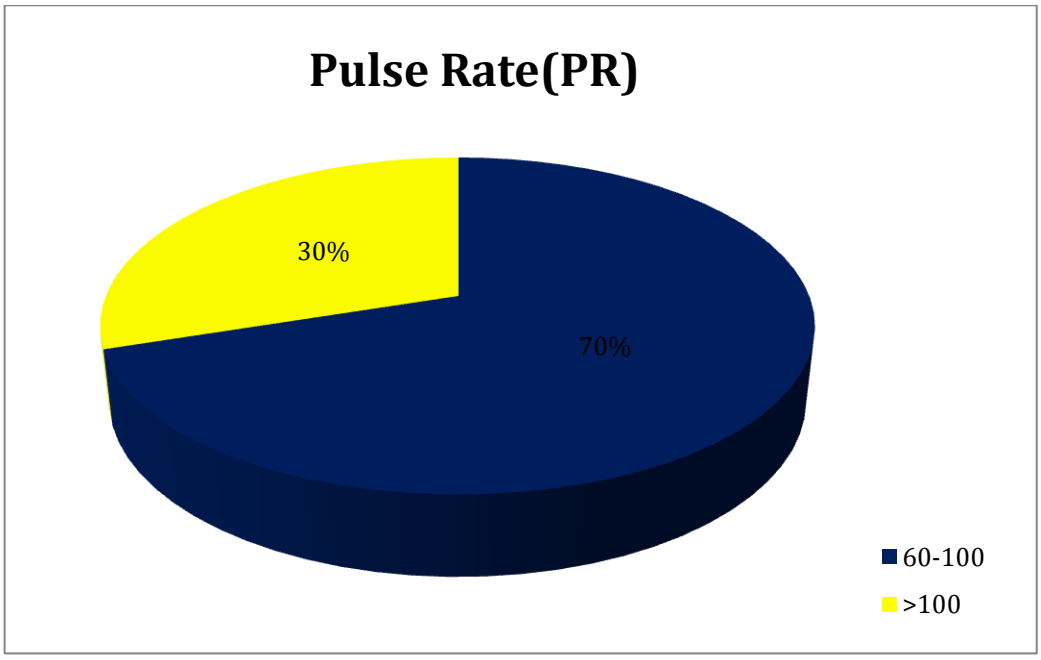


Diagram: 6

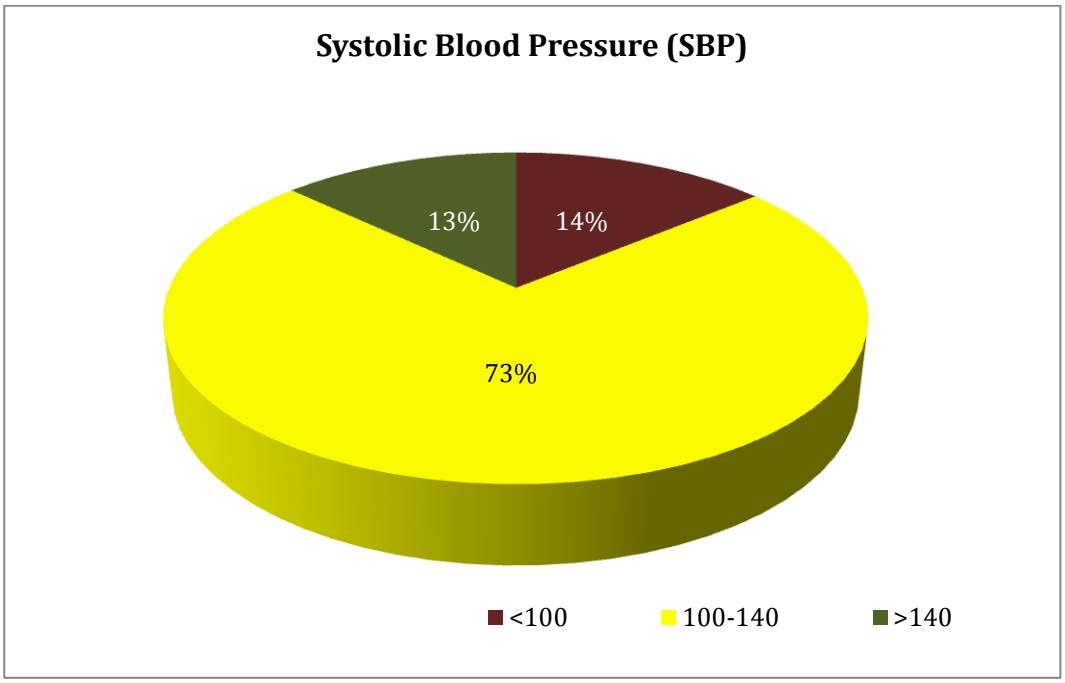


Diagram: 7

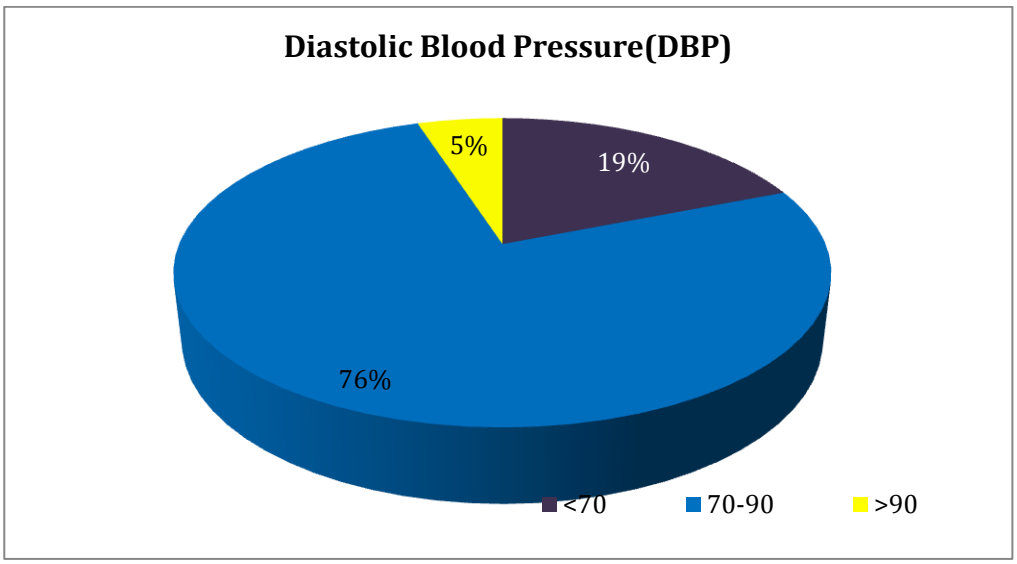


Diagram: 8

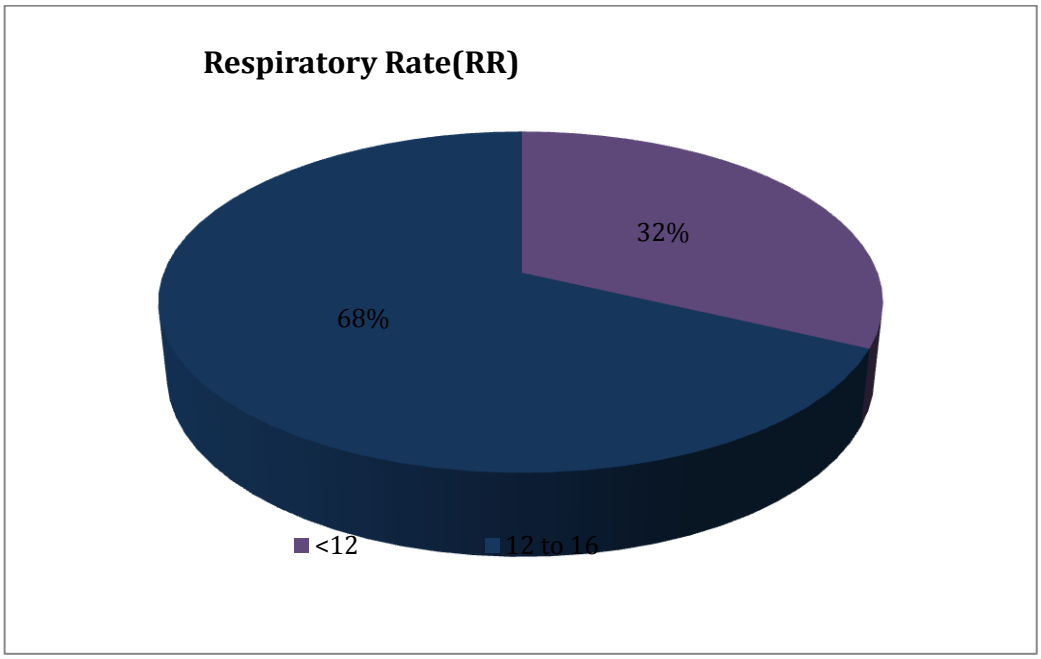
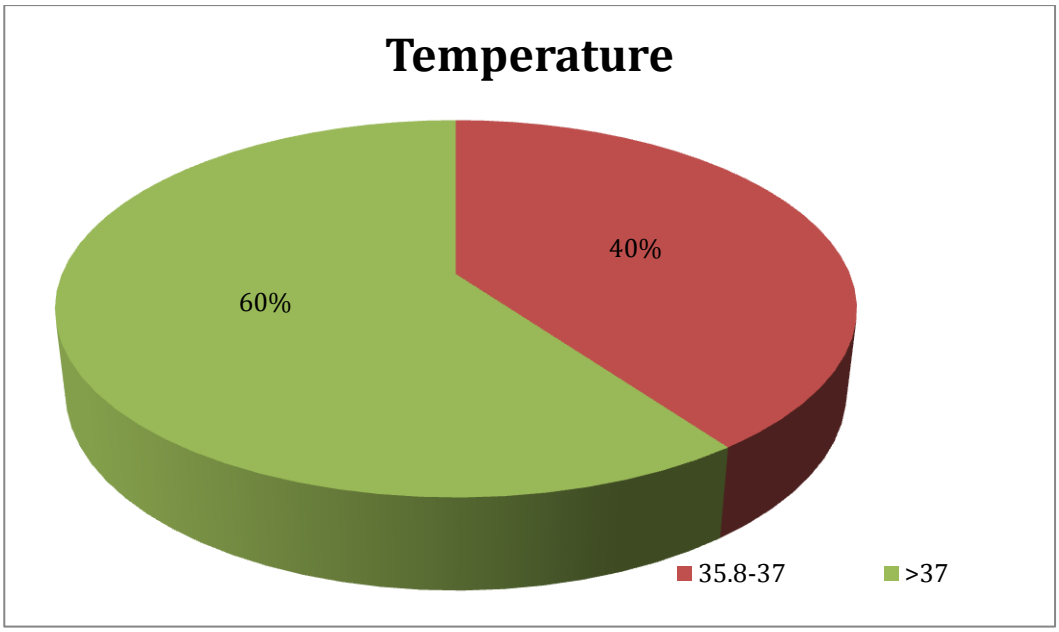


Diagram: 9



FINDINGS ON RESPIRATORY SYSTEM EXAMINATION:

In this study, increased tactile vocal fremitus(TVF) was seen in 46(74%) patients on palpation, bronchial breathing was heard in 43(68%), absent breath sounds in 2(3%) patients. Added sounds included fine crepitations being most commonly heard, in 41(65%) patients, both rhonchi and crepitations were heard in 20(32%) patients on auscultation. The details of these are shown in following tables and diagrams.

Table 8

Distribution according to Respiratory System Examination (Palpatory finding)

TVF	No. of patients	Percentage (%)
Increased	47	74
Decreased	02	4
Equal	14	22
Total	63	100

Diagram: 10

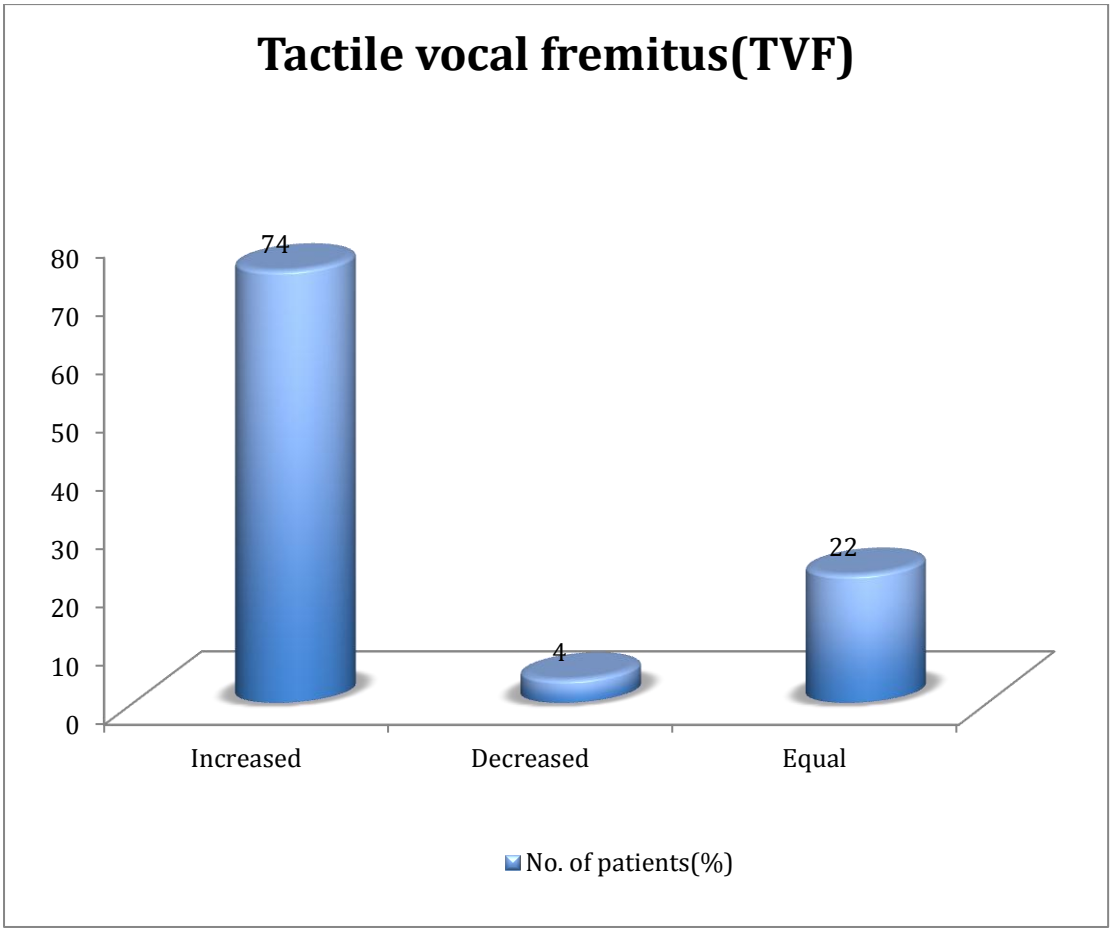

Tactile vocal fremitus(TVF)
80
70
60
50
40
30
20
10
0
74
4
22
Increased
Decreased
Equal
No. of patients(%)

Table 9

Distribution according to Respiratory System Examination (Auscultatory findings)

Breath Sounds	No. of patients	Percentage (%)
Bronchial breathing	43	68
Normal vesicular breath sounds(NVBS)	18	29
Absent	2	3
Total	63	100

Diagram: 11

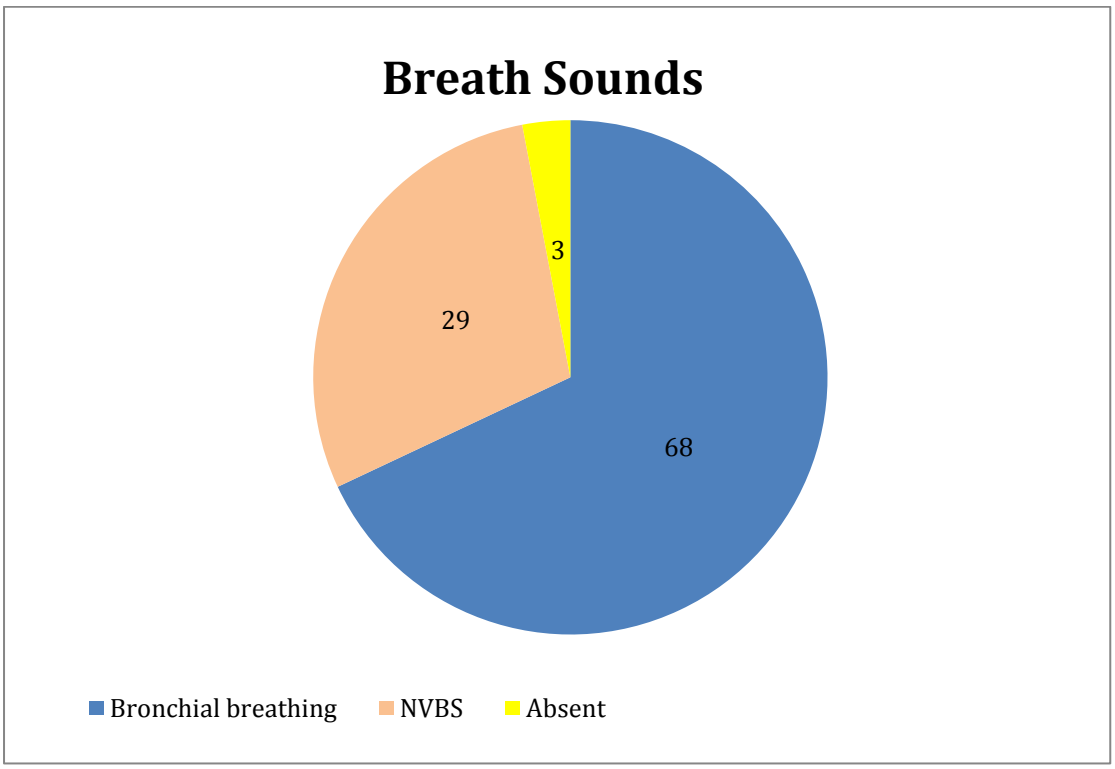
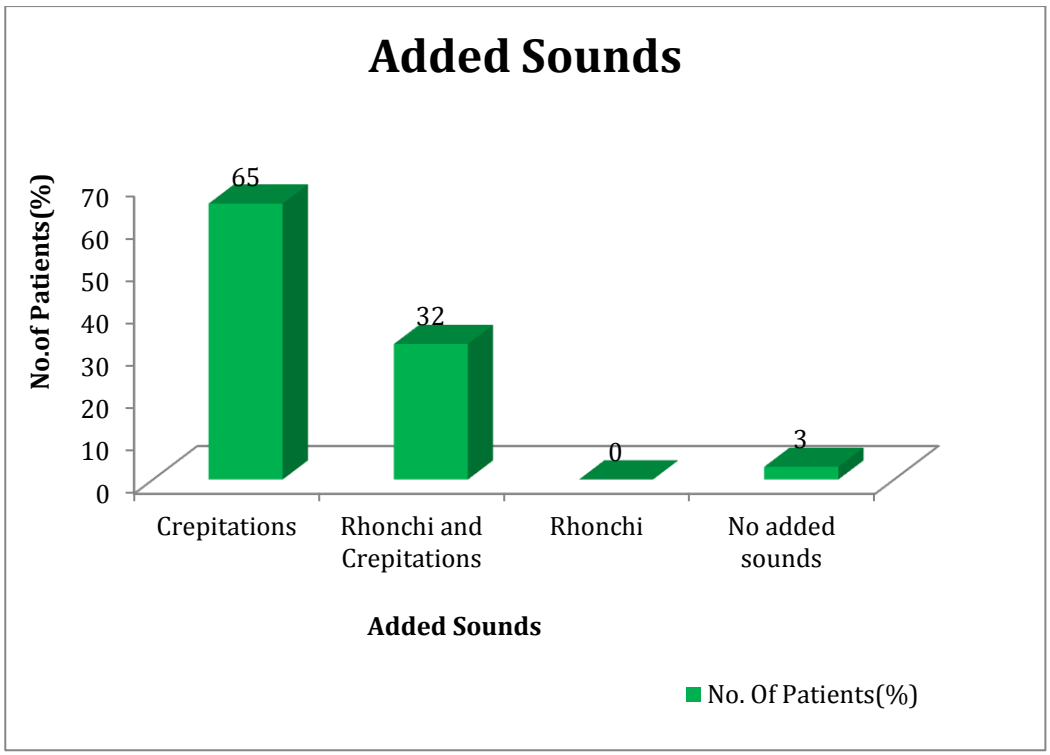


Table 9

Distribution according to Respiratory System Examination (Auscultatory findings)

Added sounds	No. of patients	Percentage (%)
Crepitations	41	65
Rhonchi and Crepitations	20	32
Rhonchi	0	0
No added sounds	02	03
Total	63	100

Diagram: 12



LABORATORY CHARACTERISTICS:

Leucocytosis defined as total leucocyte count >11,000/cum was the most common, noted in 53(84%) patients. Mean total leucocyte count was 18925.62. Anemia defined as Hb < 10gm/dl was noted in 12(19%) patients, mean Hb was 10.97gm/dl. ESR >20mm at 1 hour was noted in 44(70%) patients, Mean ESR was 46.35mm. Details of these are shown in table: 10

Table 10

Lab characters	N	Minimum	Maximum	Mean	Std. Deviation
TC	63	6510	58270	18925.62	9169.825
Hb	63	6.4	15	10.97	1.755
ESR	63	5	120	46.35	29.976

Table 11

Lab characters	No. of patients	Percentage (%)
TC		
4000-11000	10	16
>11000	53	84
Hb		
≤10	12	19
10-14	50	79
>14	01	02
ESR		
0-20	19	30
>20	44	70
Total	63	100

TC: Total count, Hb: Hemoglobin ESR: Erythrocyte sedimentation rate

Diagram: 13

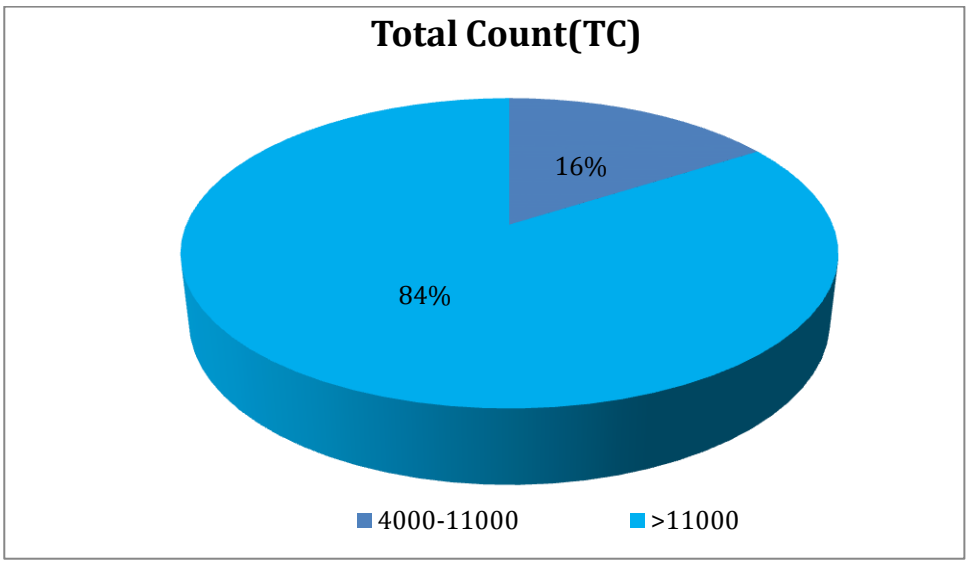


Diagram: 14

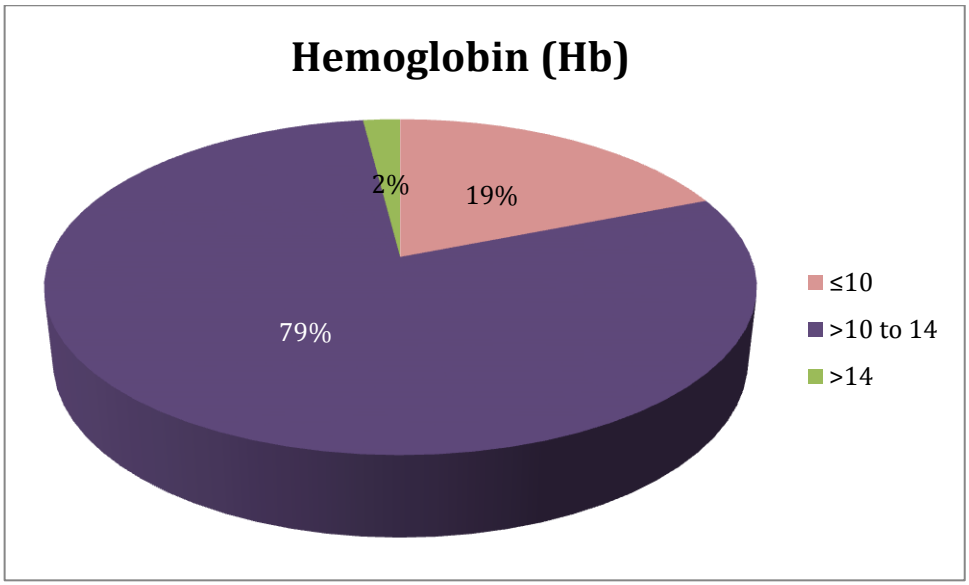
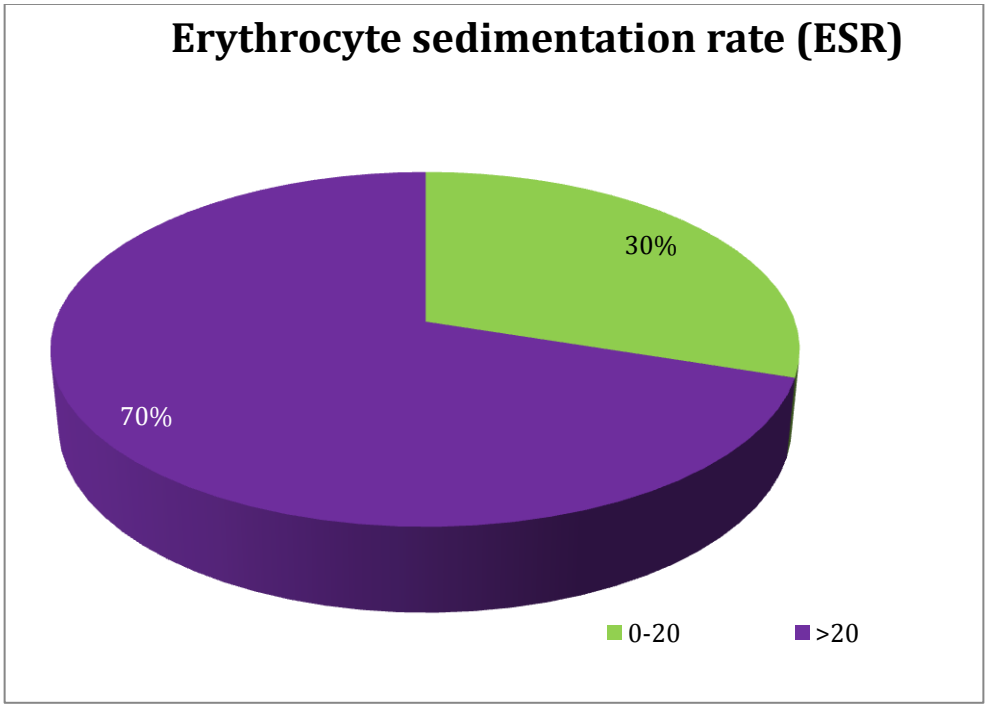


Diagram: 15



RESULTS OF SPUTUM GRAM STAINING:

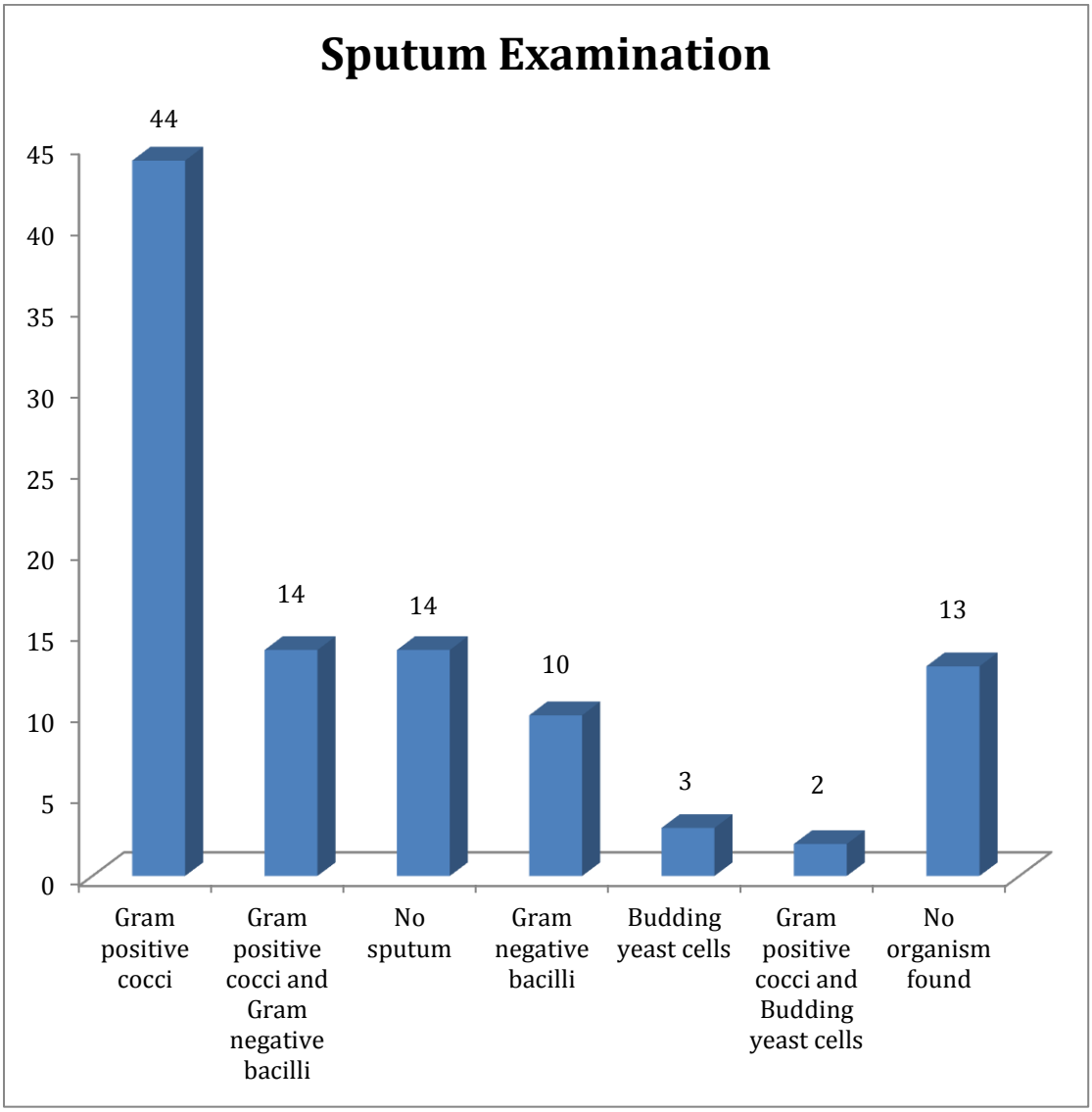
On Gram staining, Sputum sample showed the presence of Gram positive cocci predominantly in 28(44%) patients, Gram negative bacilli in 6(10%), both Gram positive cocci and Gram negative bacilli in 9(14%), budding yeast cells in 2(3%) patients. No organisms were obtained in 8(13%) patients and 9(14%) patients, cough was not associated with expectoration hence no sputum was given for examination. This is shown below,

Table 12

Distribution according to Sputum Examination: Gram staining

Sputum Examination	**No. of patients**	**Percentage (%)**
Gram positive cocci	28	44
Gram positive cocci and Gram negative bacilli	09	14
No sputum	09	14
Gram negative bacilli	06	10
Budding yeast cells	02	03
Gram positive cocci and Budding yeast cells	01	02
No organism found	08	13
Total	63	100

Diagram: 16



All the patients with expectoration, sputum examination was negative for acid fast bacilli on ZN staining.

RESULTS OF SPUTUM CULTURE:

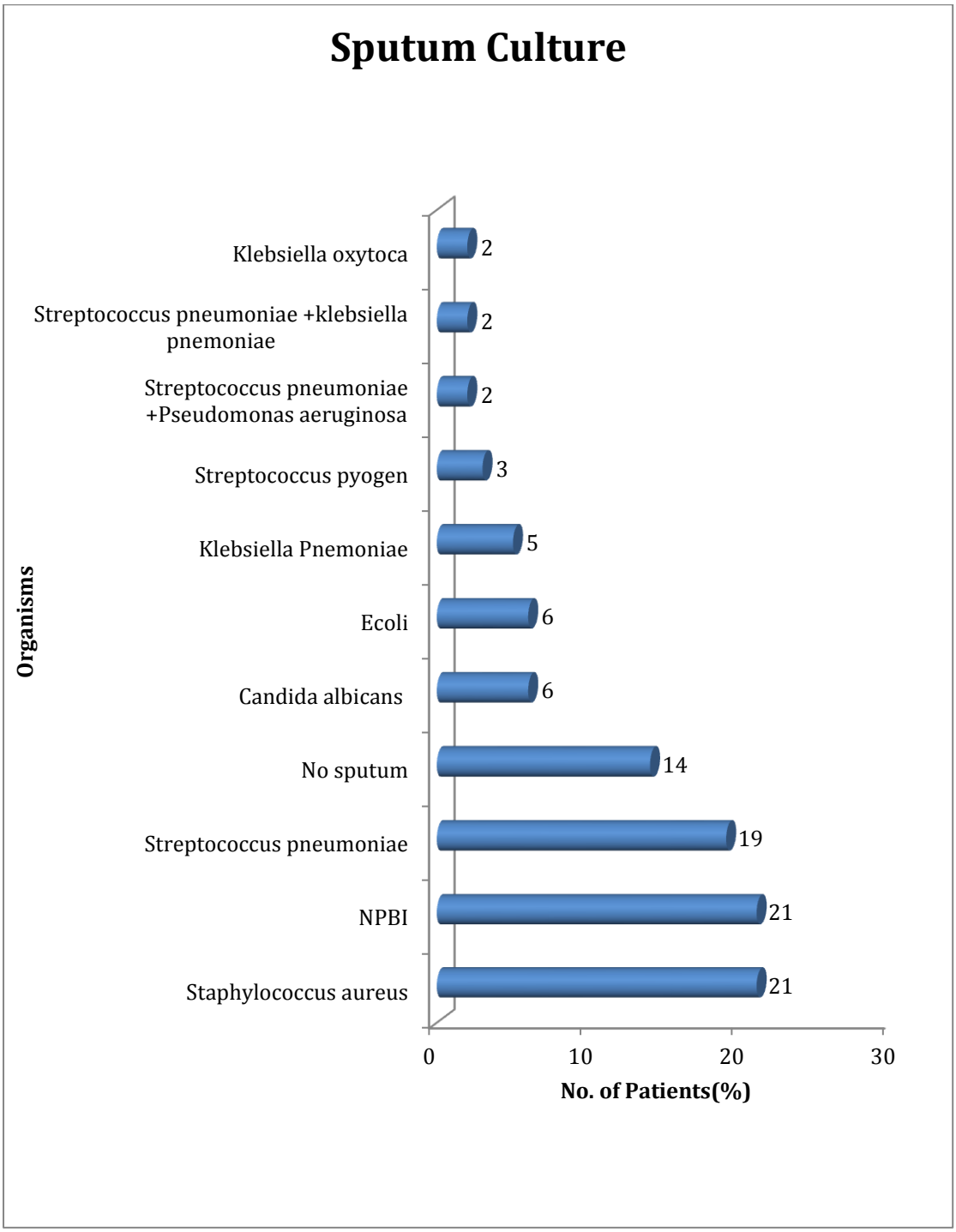
In this study, predominantly isolated organism was Staphylococcus aureus 13(21%) followed by Streptococcus pneumonia 12(19%), Klebsiella pneumonia in 3(5%) patients, Candida albicans in 4(6%) patients. No organisms were obtained in 8(13%) patients and 9(14%) patients, cough was not associated with expectoration hence no sputum was given for examination. This is shown below,

Table 13

Sputum Culture

Sputum Culture	**No. of patients**	**Percentage (%)**
Staphylococcus aureus	13	21
No pathogenic organism isolated (NPBI)	13	21
Streptococcus pneumoniae	12	19
No sputum	09	14
Candida albicans	04	06
Ecoli	04	06
Klebsiella Pnemoniae	03	05
Streptococcus pyogen	02	03
Streptococcus pneumonia +Pseudomonas aeruginosa	01	2
Streptococcus pneumoniae +Klebsiella pneumoniae	01	2
Klebsiella oxytoca	01	2
Total	63	100

Diagram: 17


Sputum Culture
Organisms
Klebsiella oxytoca
2
Streptococcus pneumoniae +klebsiella pnemoniae
2
Streptococcus pneumoniae +Pseudomonas aeruginosa
2
Streptococcus pyogen
3
Klebsiella Pnemoniae
5
Ecoli
6
Candida albicans
6
No sputum
14
Streptococcus pneumoniae
19
NPBI
21
Staphylococcus aureus
21
0
10
20
30
No. of Patients(%)

RADIOLOGICAL FINDINGS:

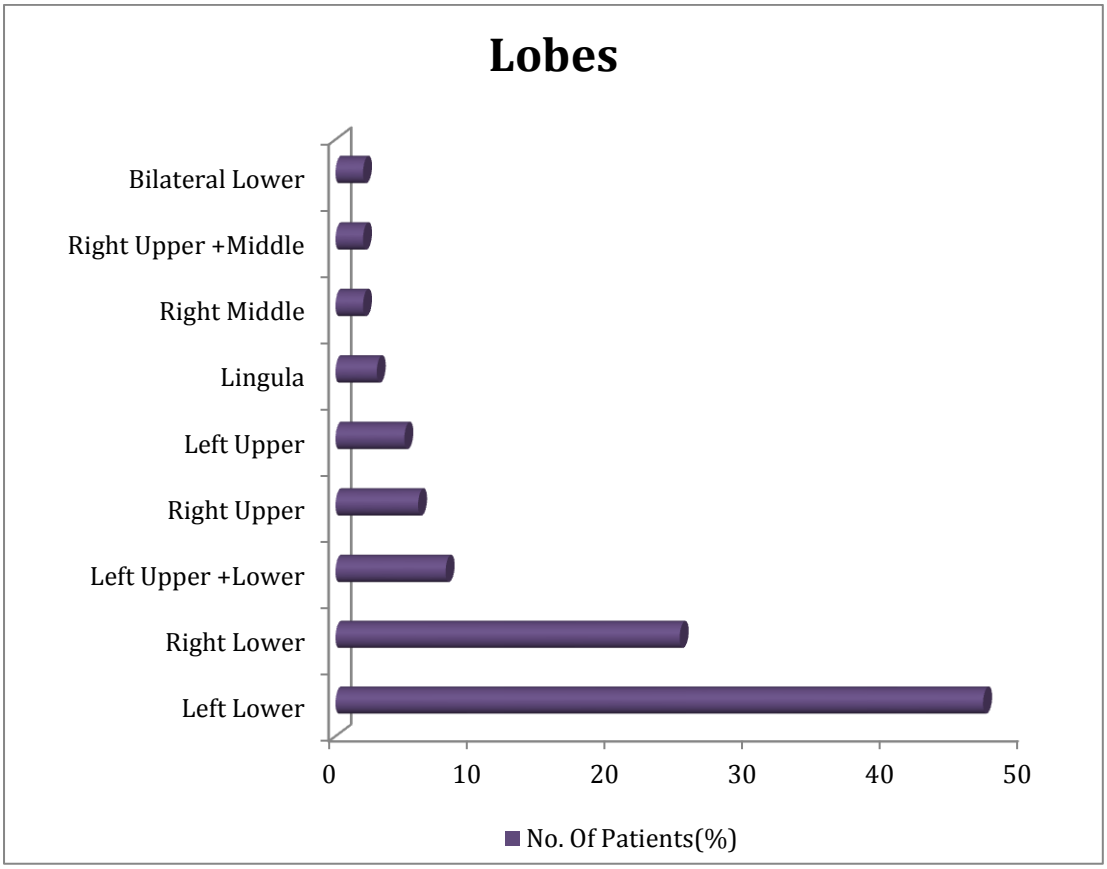
On chest X-ray, it was found that left lower lobe is most commonly involved that is in 29(47%) patients, followed by right lower lobe in 16(25%). Bilateral lung involvement was noted in 1(2%) patient. This is shown below,

Table: 14

Lobe involvement:

Lobe involvement	**No. of patients**	**Percentage (%)**
Left Lower	29	47
Right Lower	16	25
Left Upper +Lower	05	08
Right Upper	04	06
Left Upper	03	05
Lingula	02	03
Right Middle	01	2
Right Upper +Middle	01	2
Bilateral Lower	01	2
Total	63	100

Diagram: 18


Lobes
Bilateral Lower
Right Upper +Middle
Right Middle
Lingula
Left Upper
Right Upper
Left Upper +Lower
Right Lower
Left Lower
0
10
20
30
40
50
No. Of Patients(%)

COMPLICATIONS:

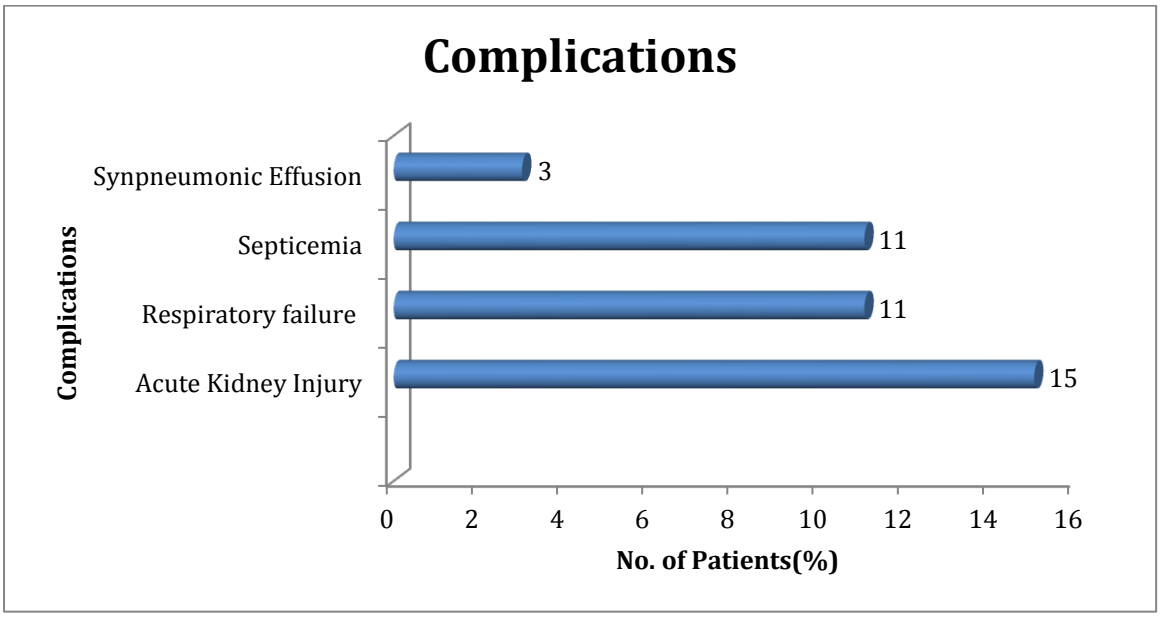
The most common complication noted was acute kidney injury in 9(15%) patients, followed by septicemia in 7(11%) patients, Respiratory failure in 7(11%), synpneumonic effusion in 2(3%) patients. Details of this are shown in table: 15 and bar diagram: 19

Table: 15

Distribution according to Complications

Complications	No. of patients	Percentage (%)
Acute kidney injury	09	15
Respiratory failure	07	11
Septicemia	07	11
Synpneumonic Effusion	02	3

Diagram: 19



OUTCOME:

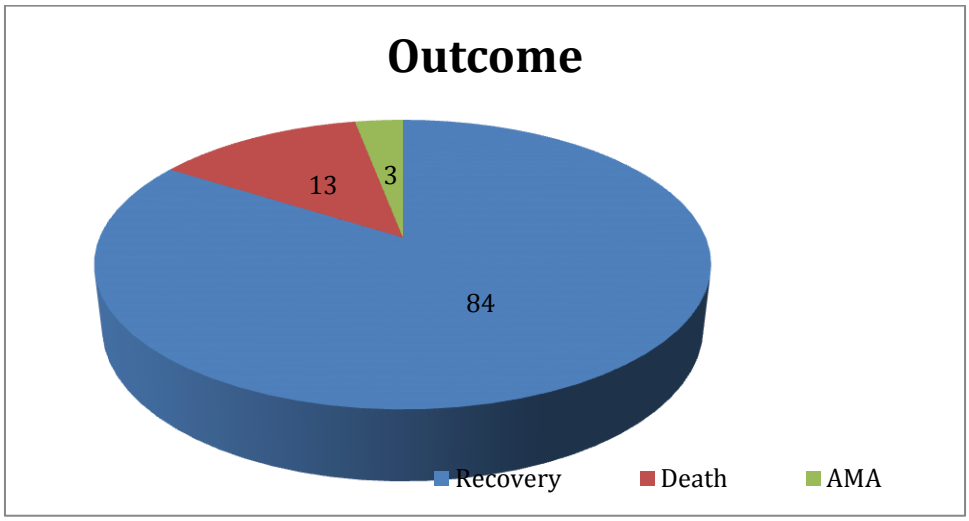
In this study, out of 63 patients, 53(84%) patients recovered, mortality was seen in 8(13%) patients. The remaining 2(3%) patients got discharged against medical advice (AMA). This is depicted in Table: 16, diagram: 20

Table: 16

Distribution according to Outcome

Outcome	No. of patients	Percentage (%)
Recovery	53	84
Death	8	13
AMA	2	03
Total	63	100

Diagram: 20



AMA: Against medical advice

ANALYSIS OF PROGNOSTIC FACTORS FOR COMMUNITY ACQUIRED PNEUMONIA IN ELDERLY

Table : 17

Association of age with outcome

Age	Survived	Not survived	Total	P value
60-74	37	01	38	P=0.0075*
75-84	12	05	17	
≥ 85	04	02	06	

*Significant association

Table : 18

Association of chief complaints with outcome

Chief Complaints	Survived	Not survived	Total	P value
Fever	41	08	49	P=0.3366
Cough	52	08	60	P=1.000
Expectoration	32	04	36	P=0.7056
Breathlessness	28	03	31	P=0.479
Chills	20	05	25	P=0.2541
Chest pain	11	02	13	P=1.00
Nausea and vomiting	04	0	04	P=1.00
Abdominal pain	04	00	04	P=1.00
Giddiness	02	02	04	P=0.0798
Headache	02	00	02	P=1.00
Hemoptysis	01	01	02	P=0.2470
Back pain	01	00	01	P=1.00
Altered sensorium	01	00	01	P=1.00
Convulsions	00	01	01	P=0.1311

*Significant association

Table 19

Association of vitals and lab findings with outcome

Variables	Survived	Not survived	Total	P value
PR				
60-100	40	02	42	P=0.0087*
>100	13	06	19	
SBP				
<100	07	02	09	P=0.6783
100-140	39	05	44	
>140	07	01	08	
DBP				
<70	09	03	12	P=0.3423
70-90	41	05	46	
>90	03	00	03	
RR				
12-16	18	02	20	P=1.00
>16	35	06	41	
Temp				
35.8-37	19	04	23	P=0.2344
>37	49	04	38	
TC				
4000-11000	09	01	10	P=1.00
>11000	44	7	51	
Hb				
<10	10	01	11	P=0.8327
10 to 14	42	07	49	
>14	01	0	01	
ESR				
0-20	15	04	19	P=0.2414
>20	38	04	42	

*Significant association

Table : 20

Association of complications with outcome.

Outcome	Yes	No	'P' value
Acute kidney injury (AKI)			
Survived (n=53)	8	45	P=1.0
Non survived (n=8)	1	7	
Respiratory failure			
Survived (n=53)	5	48	P=0.3774
Non survived (n=8)	2	6	
Septicemia			
Survived (n=53)	4	49	P=0.0415*
Non survived (n=8)	3	5	
Synpneumonic effusion			
Survived (n=53)	2	51	P=1.0
Non survived (n=8)	0	8	

*Significant association

Analysis of prognostic factors for community acquired pneumonia in elderly

Statistical analysis was done to find the association between characteristics studied and the outcome (Survived n=53, Non survived n=8). Among 63 patients, two patients who got discharged against medical advice (AMA=2) were excluded from statistical analysis.

'P' value of <0.05 was taken as statistically significant.

Analysis showed that age distribution has significant association P=0.0075 with outcome. There was a significant association between tachycardia and outcome, P=0.0087.

It was found that septicemia was associated with outcome statistically, P=0.0075.

There was no significant association found between chief complaints and outcome.

DISCUSSION

Community acquired pneumonia (CAP) is a common infectious cause of hospital admission and mortality in elderly patients all over the world. The clinical presentation, etiology and outcome of community acquired pneumonia in elderly differs from that of other population.

In the present study, 63 patients of community acquired pneumonia >60 years of age were included. The results of study which has been described are discussed below.

Age Distribution

In this study, the age group of patients varied from 60 to 99 years. Mean age was 71.14 years. Majority of patients were in the age group 60–74 years which constituted 60%, it is similar to the study conducted by Abdulla BB[57] where 64% of patients were between 65-75 years. Out of 63 patients, 38(60%) were males and 25 (40%) were females.

Sex Distribution:

In this study males 38(60%) were affected more than females 25(40%). This sex distribution is contradicted to study conducted by Bochud PY[58] where 48.2% were males and 51.8% were females. This observation of incidence of pneumonia more in males may be attributed to increased rates of alcoholism and smoking in males in our geographic area and also due to the increased association of comorbid conditions like COPD, congestive cardiac failure and others in males.

Presenting Complaints:

Elderly patient present with typical as well as atypical symptoms. The clinical presentation may consist of typical respiratory symptoms like cough, breathlessness, chest pain to atypical symptoms like altered sensorium, giddiness, headache, gastrointestinal symptoms.

In our study, cough was the commonest symptom seen in 62(98%) patients, which is similar to the study by Shah BA[52] where in it was noted in 99% and Bochud PY[58] 96%, Abdulla BB[57], 74% was noted.

Sputum production is not very commonly associated with cough in elderly, noted in 57% patients in our study, similarly it is noted in 65% patients by Shah BA[52], 52% patients by Bochud PY[58] and 64% patients by Abdulla BB[57].

Fever was seen in 78% patients in our study, 81% by Bochud PY[58], 56% by Abdulla BB[57] but Ruiz M[59] noted fever only in 27% of study population.

Fever in pneumonia is usually associated with chills which may not be seen commonly in elderly. In our study, chills were seen in 40% patients, which was similar to the study by Ruiz M[59], 41% patients and 59% in study by Bochud PY[58] .

Breathlessness was seen in almost half the study population that is 51% patients in our study, which was found similar in study by Bochud PY[58], 46% patients but was observed only in 22% patients by Abdulla BB[57].

Chest pain was not commonly presenting complaint in our study, constituted about 22%, which was found similar to the study by Abdulla BB[57], 20% and Ruiz M[59] noted in 32%. But the study conducted by Shah BA[52] had 75% patients with chest pain.

Atypical symptoms like gastrointestinal symptoms including pain abdomen, nausea vomiting were seen in 12% patients in our study, 8% in study by Abdulla BB[57].

Neurological symptoms like altered sensorium was found in only 2% patients in our study, where as seen in 16% by Abdulla BB[57].

Headache was noted in 3% patients in our study, where as 58% in study by Bochud PY[58].

Habits:

Smoking was the commonest habit observed in our study, constituted about 19%. It is found similar by Shah [BA52] 65%, Bochud PY[58] 35.3%, Abdulla BB[57] 74%.

Comorbidities:

Diabetes mellitus, Anemia, Chronic obstructive pulmonary disease, Ischemic heart disease are commonly noted comorbidities, which is found similar to the study by Abdulla BB[57].

Diabetes mellitus and Anemia were the commonest comorbidities noted in our study, 19% patients, where as chronic obstructive pulmonary disease was commonest in the study by Abdulla BB[57], 48% and Shah BA[52] 57%.

Anemia was second common comorbidity noted by Abdulla BB[57] that is 32%, followed by Diabetes Mellitus, 24% and Ischemic heart disease, in 16% patients.

No comorbidity was noted in 41% patients in our study and in 70% patients by Bochud PY[58].

Vitals:

Our study revealed tachycardia in only 30% of cases where in the study by Abdulla BB[57] showed tachycardia in 84% and 92% by Shah BA[52].

Hypotension, Tachypnea, raised temperature were noted in similar number of patients in our study and the study by Abdulla BB[57] .

Systemic examination:

On respiratory system examination, on palpation, increased tactile vocal fremitus is felt in 73% patients in our study where in it is noted only in 20% patients in study by Abdulla BB[57].

On auscultation, bronchial breath sounds were heard in 68% patients in our study, where as it is heard in only 24% patients by Abdulla BB[57] and 4% patients by Bochud PY[58].

Crepitations were heard in 97% patients in our study found similar to the study by Abdulla BB[57], 94%. But Bochud PY[58] noted only in 69% patients.

Laboratory Characteristics

Leukocytosis was observed in 84% patients in our study. The study by Abdulla BB[57] also observed leukocytosis in 84% patients. Ruiz M[59] noted in 60% and Shah BA[52] in 43% patients.

Raised ESR was noted in 70% patients in our study found similar in 76% patients by Abdulla BB[57].

Gram staining

On Gram staining of sputum, Gram positive cocci were isolated in 44% patients in our study, Gram negative bacilli in 10% patients and mixed in 14% patients. On comparing with the study by Abdulla BB[57], found similar results.

Sputum culture

In this study. Staphylococcus aureus was the most common etiological agent isolated, 21% patients, followed by Streptococcus pneumonia, 19%. Gram negative

bacilli like Klebsiella pneumonia 6%, E.coli 6% patients. Candida albicans was isolated in 6% patients.

Where as study conducted by Abdulla BB[57], Streptococcus pneumonia is the commonest organism isolated, constitutes about 16%, followed by Klebsiella pneumonia 6%, Pseudomonas aeruginosa in 4%, Stapylococcus aureus in 2% and Ecoli in 2% patients.

Ruiz M[59] and Garcia[12] also noted Streptococcus pneumonia as the commonest organism isolated.

The cause of CAP is often difficult to establish. The most effective methods are often invasive and cannot always be justified and serological diagnosis is too late to be of any therapeutic use. Despite the progress made in the diagnosis of pneumonia, it takes a few days to identify the causative microorganism in the blood or sputum samples and the etiology of half of all patients with CAP remains uncertain[60].

Radiological Presentation:

The Radiological data in our study showed a predominance of left lung involvement, especially the lower lobe that is 47% cases, which is found similar to the study by Bochud PY[58] that is 49% cases.

Complications:

Various complications noted in our study are acute kidney injury 15%, septicemia 11%, respiratory failure 11%, pleural effusion 3%.

Abdulla BB[57] noted septic shock in 16% cases, pleural effusion in 12%, respiratory failure in 4%.

Pleural effusion was noted in 20% of study population by Bochud PY[58].

Outcome

A total of 84% patients recovered completely which is found similar to Abdulla BB[57] (84%).

Mortality was noted in 13% patients in our study and in 16% patients by Abdulla BB[57].

Among 63 patients in our study, 2(3%) patients got discharged against medical advice whose outcome could not be assessed.

Analysis of prognostic factors for community acquired pneumonia in elderly

Our study showed statistically significant association between age, tachycardia and septicemia with the oucome with P=0.0075, P=0.0087, P=0.0075 respectively.

Study conducted by Abdulla BB[57] showed similar association with tachycardia and septicemia but did not show any association between age.

CONCLUSION

Community acquired pneumonia in elderly patients is a common and serious problem encountered in clinical practice. Elderly patients with community acquired pneumonia have different clinical presentation and higher mortality. Elderly patients may present with atypical symptoms like altered sensorium, giddiness, headache and gastrointestinal symptoms, other than the typical respiratory symptoms of pneumonia include cough, expectoration, dyspnea and chest pain. They may not have all the classical signs of consolidation and may present with only few signs like tachypnea, tachycardia and crepitations. The atypical presentations may lead to delay in diagnosis and initiation of treatment and may be responsible for higher observed mortality in elderly patients with pneumonia.

Etiological agents cannot be identified in many cases because of difficulty in collecting sputum in elderly patients, lower yield of culture and various atypical and difficult to isolate causative organisms. Hence the need for a empirical therapy covering both typical and atypical organisms.

SUMMARY

1. This prospective study was conducted in Shri B M Patil Medical College Hospital and Research centre, BLDEU, Vijayapur. A total of 63 patients of age > 60 years presenting with community acquired pneumonia were included in the study.
2. The age group of the patients varied from 60 – 99 years with a mean age of 71.14(9.83) years. 60% of patients were males and 40% females.
3. Most of the patients had associated co-morbid conditions like diabetes mellitus, anemia, COPD, IHD. Of these diabetes mellitus and anemia were the most commonly seen comorbidity, present in 12(19%)patients. Smoking was the commonest habit noted.
4. Patients presented with both typical and atypical symptoms. Typical respiratory symptoms were cough, expectoration, fever, breathlessness, chest pain. Atypical symptoms were altered sensorium and gastrointestinal symptoms. Cough was the most common respiratory symptom, present in 62(98%)patients. Gastrointestinal symptoms were seen in 8(12%) patients and 1(2%) presented with altered sensorium.
5. Most patients had fewer signs on examination. Tachypnea (68%), Tachycardia (30%) and crepitations (97%) were most common clinical signs noted.
6. Leucocytosis was the most common laboratory findings noted in 53(84%) patients.
7. Sputum Gram positive cocci noted in 28(44%) patients, Gram negative bacilli in 6(10%) patients, both in 9(14%).

8. Bacterial isolation by sputum culture showed Staphylococcus aureus as most common isolated organism 13(21%) patients followed by Streptococcus pneumoniae 12(19%). Other organisms isolated were Klebsiella pneumoniae in 3(5%), Ecoli in 4(6%), Candida albicans in 4(6%), Streptococcus pyogens in 2(3%).
9. Left lower lobe pneumonia was the most common radiological presentation noted in 29(47%) patients.
10. Acute kidney injury 9(15%) was the most common complication followed by septicemia and respiratory failure 7(11%) and pleural effusion was seen in 2(3%) patients.
11. Mortality was noted in 8(13%) patients.

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ANNEXURES

ETHICAL CLEARANCE CERTIFICATE

Institutional Ethical Committee
BIJAPUR-586 103.
OUTWARD
No. 54/14
Date 24/11/14
BLDEU's Shri. B. M. Patil Medical College

B.L.D.E. UNIVERSITY'S
SHRI.B.M.PATIL MEDICAL COLLEGE, BIJAPUR-586 103
INSTITUTIONAL ETHICAL COMMITTEE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this college met on 22-11-2014 *at* 3-30pm *to scrutinize the Synopsis of Postgraduate Students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected & revised version synopsis of the Thesis has been accorded Ethical Clearance.*

Title "clinical profile of community acquired pneumonia in elderly"

—— x —— x —— x ——

Name of P.G. student Dr. Shruti. S. Kolli, Dept of Medicine

Name of Guide/Co-investigator Dr Anand. P. Ambali, professor of Medicine

for

DR.TEJASWINI. VALLABHA
CHAIRMAN
INSTITUTIONAL ETHICAL COMMITTEE
BLDEU'S, SHRI.B.M.PATIL
MEDICAL COLLEGE, BIJAPUR.

Following documents were placed before E.C. for Scrutinization
1) Copy of Synopsis/Research project.
2) Copy of informed consent form
3) Any other relevant documents.

CONSENT FORM

BLDEU'S SHRI B. M. PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE, VIJAYAPUR- 586103

TITLE OF THE PROJECT - CLINICAL PROFILE OF COMMUNITY ACQUIRED PNEUMONIA IN ELDERLY.

PRINCIPAL INVESTIGATOR - Dr SHRUTI S. KOLLI

P.G.GUIDE NAME - Dr ANAND P. AMBALI
PROFESSOR OF MEDICINE

CHAIRMAN ETHICAL COMMITTEE

All aspects of this consent form are explained to the patient in the language understood by him/her.

I) **INFORMED PART**

1) PURPOSE OF RESEARCH:

I have been informed about this study. I have also been given a free choice of participation in this study.

2) PROCEDURE:

I am aware that in addition to routine care received I will be asked series of questions by the investigator. I have been asked to undergo the necessary investigations and treatment, which will help the investigator in this study

3) RISK AND DISCOMFORTS:

I understand that I may experience some pain and discomfort during the examination or during my treatment. This is mainly the result of my condition and the procedure of this study is not expected to exaggerate these feelings that are associated with the usual course of treatment

4) BENEFITS:

I understand that my participation in this study will help to patients survival and better outcome.

5) CONFIDENTIALITY:

I understand that the medical information produced by this study will become a part of Hospital records and will be subject to the confidentiality and privacy regulation. Information of a sensitive personal nature will not be a part of the medical records, but will be stored in the investigator's research file and identified only by a code number. The code-key connecting name to numbers will be kept in a separate location.

If the data are used for publication in the medical literature or for teaching purpose, no name will be used and other identifiers such as photographs and audio or videotapes will be used only with my special written permission. I understand that I may see the photographs and videotapes and hear the audiotapes before giving this permission.

6) REQUEST FOR MORE INFORMATION:

I understand that I may ask more questions about the study at anytime. Dr SHRUTI S. KOLLI is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might influence my continued participation.

If during the study, or later, I wish to discuss my participation in or concerns regarding this study with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me. A copy of this consent form will be given to me to keep for careful reading.

7) REFUSAL OR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary and that I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital. I also understand that Dr SHRUTI S. KOLLI may terminate my participation in the study after she has explained the reasons for doing so and has helped arrange for my continued care by my own physician or physical therapist, if this is appropriate.

8) INJURY STATEMENT:

I understand that in the unlikely event of injury to me resulting directly from my participation in this study, if such injury were reported promptly, the appropriate treatment would be available to me, but no further compensation would be provided. I understand that by my agreement to participate in this study I am not waiving any of my legal rights.

I have explained to _____the purpose of the research, the procedures required and the possible risks and benefits to the best of my ability in patient's own language.

_____ _____

Dr SHRUTI S. KOLLI Date

(Investigator)

II) STUDY SUBJECT CONSENT STATEMENT:

I confirm that Dr SHRUTI S. KOLLI has explained to me the purpose of research, the study procedures that I will undergo, and the possible risks and discomforts as well as benefits that I may experience in my own language. I have read and I understand this consent form. Therefore, I agree to give consent to participate as a subject in this research project.

_____ _____

Participant / Guardian Date

_____ _____

Witness to signature Date

PROFORMA

BLDE'S SHRI B.M.PATIL MEDICAL COLLEGE

HOSPITAL AND RESEARCH CENTRE, VIJAYAPUR

Name:	CASE NO:
Age:	IP NO:
Sex:	DOA:
Religion:	DOD:

Past Occupation:

Present Occupation:

Residence:

Chief complaints:

History of present illness:

Fever

Cough

Expectoration

Hemoptysis

Chest pain

Breathlessness

Giddiness and Fall

Altered sensorium

Others/ Travelling history

Past History:

History of hypertension

History of IHD

History of tuberculosis

History of diabetes mellitus

History of malignancy

History of Hepatic or Renal diseases

History of blood transfusion

History of COPD

History of Asthma

History of immunization:

Personal History:

Diet/appetite:

Sleep:

Bladder and bowel habits :

Smoking/Tobacco chewing/Snuff Inhalation/alcohol:

Family History:

TB: Asthma: Malignancy: DM: HTN:

Treatment History:

General Physical Examination

Height :

Weight:

Body Mass Index :

Vitals

PR:

BP:

RR:

Temp:

Head to toe examination:

SYSTEMIC EXAMINATION.

Respiratory System

Upper respiratory tract :

Lower respiratory tract:

A. INSPECTION:

1. Shape of chest:

2. Drooping of shoulder:

3. Ly of ribs:

4. Trachea:

5. Apex beat:

6. Chest movements:

7. Any engorged veins:

8. Visible pulsations/scars:

9. Spine

B. PALPATION:

1. Trachea:

2. Apex beat:

3. Chest movements:

4. Tactile vocal fremitus:

	Right	Left
Supraclavicular		
Infraclavicular		
Mammary		
Inframammary		
Axillary		
Infraaxillary		
Suprascapular		
Interscapular		
Infrascapular		

5.Measurements:

AP diameter:

Transverse diameter:

Right hemithorax:

Left hemithorax:

Circumference:

On inspiration:

On expiration:

Expansion:

C. PERCUSSION:

Resonant/ Dull/ Hyperresonant:

Site:

D.AUSCULTATION:

1. Air entry:

2. Breath sounds:

3. Rhonchi

4. Crepitations:

5. Wheeze:

6. Pleural rub:

7. Bronchophony:

8. Egophony:

9. Whispering pectoriloquy:

10. Vocal resonance:

	Right	Left
Supraclavicular		
Infraclavicular		
Mammary		
Inframammary		
Axillary		
Infraaxillary		
Suprascapular		

Interscapular

Infrascapular

Cardiovascular System

Central Nervous System

Per abdomen

INVESTIGATIONS

HAEMATOLOGY –

Haemoglobin	gm %
Total WBC counts	Cells/mm^3
Differential counts -	
Neutrophils	%
Lymphocytes	%
Eosinophils	%
Monocytes	%
Basophils	%
ESR	mm after 1 hour

Sputum for Gram stain:

AFB:

Sputum culture & sensitivity:

Chest X-ray:

ECG:

CT (if done):

Bronchoscopy (if done):

ABG (if done)

BIOCHEMISTRY:

Serum electrolytes:

Serum creatinine:

URINE EXAMINATION -

Albumin	
Sugar	
Microscopy	

FINAL DIAGNOSIS

TREATMENT GIVEN

COMPLICATIONS

OUTCOME:

Improved:

Require ventilatory support/ no: Days:

Death:

Total stay in critical care:

in general ward:

KEY TO MASTER CHART

IP No.	In-patient number
M	Male
F	Female
DOA	Date of admission
Exp	Expectoration
HTN	Hypertension
DM	Diabetes mellitus
COPD	Chronic obstructive pulmonary disease
IHD	Ischemic heart disease
LVF	Left ventricular failure
PTB	Pulmonary tuberculosis
ALD	Alcoholic liver disease
Hypothyr	Hypothyroidism
PR	Pulse rate
BP	Blood pressure
RR	Respiratory rate
TVF	Tactile vocal fremitus
VR	Vocal resonance
BS	Breath sounds
NVBS	Normal vesicular breath sounds
UL	Upper lobe
LL	Left lobe
ML	Middle lobe
B/L	Bilateral
TC	Total count of leucocytes

Hb	Hemoglobin
ESR	Erythrocyte sedimentation rate
+	Positive
_	Negative
ZN stain	Zeihl Neelson stain
NPBI	No pathogenic bacteria isolated
C/S	Culture sensitivity
CT	Computed tomography
CXR PA	Chest X-ray postero-anterior view
UZ	Upper zone
MZ	Middle zone
LZ	Lower zone
AKI	Acute kidney injury
GW	General ward
CCU	Critical care unit
ICU	Intensive care unit
AMA	Against medical advice
CR	Crepitations
RH	Rhonchi
N	Negative
NS	No Sputum
Inc	Increased
Eq	Equal
Dec	Decreased
Imp	Improved
BB	Bronchial Breathing