"CLINICAL PROFILE AND PATTERNS OF ANTIMICROBIAL RESISTANCE IN VENTILATOR ASSOCIATED PNEUMONIA PATIENTS-A CROSS SECTIONAL STUDY"

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ABBREVIATIONS

ATCC	-	American Type Culture Collection.
BAL	-	Bronchioalveolar Lavage.
CLSI	-	Clinical Laboratory Standards Institute.
ESBL	-	Extended Spectrum Beta lactamases.
ETA	-	Endotracheal Aspirate.
HAP	-	Hospital Acquired Pneumonia.
ICU	-	Intensive Care Unit.
IHI	-	Institute of Healthcare Improvement
MICU	-	Medical Intensive Care Unit.
MV	-	Mechanical Ventilation.
MDR	-	Multi Drug Resistant.
MBL	-	Metallobeta lactamases.
MRSA	-	Methicillin resistant Staphylococcus aureus.
MSSA	-	Methicillin sensitive Staphylococcus aureus.
MIC	-	Minimum Inhibitory Concentration
PSB	-	Protected Specimen Brush.`
VAP	-	Ventilator-associated pneumonia.

ABSTRACT

Background:

Ventilator-associated pneumonia (VAP) is the most common nosocomial infection in people receiving mechanical ventilation. The objectives of this study is to detect the etiological agents of VAP, determine their antibiotic susceptibility pattern.

Methodology:

This cross sectional study was conducted among the patient admitted in intensive care unit of KLES Dr Prabhakar Kore hospital.Patiens suffering from pneumonia on admission or during first 48 hours of mechanical ventilation were excluded.

Result:

The total of 70 patients fulfilling inclusion criteria were included in the present study. The mean age of participants was found to be 49.33±16.46yrs of age, with majority of patients in the age group of 40-60yrs of age. In present study, we have seen male preponderance with 84.3% were male and 15.7% were female patients, with male to female ratio of 6:1. 30% of them had the gram positive infections and 70% had the gram negative infection. Majority were infected with Klebsiella pnemoniae (27.1%), followed with Enterobacter cloacae (14.3%), Acinetobacter baumannii (12.9%), Pseudomonas aeruginosa (10%) and CONS in 8.6%. More than 30% of sensitivity was seen with Tigecycline, followed by more than 20% sensitivity to the gentamycin.

Conclusion:

Prevalence of multidrug-resistant microorganisms are at increasing rate. Among them, gram negative organism are predominant than the gram positive organisms. The resistance pattern of these infections can assist a facility in developing an efficient antimicrobial policy

Keyword: Antibiotics, Ventilator associated pneumonia, sensitivity pattern, Drug resistance.

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INTRODUCTION

Patients who are mechanically ventilated are at risk for developing ventilator-associated pneumonia .VAP is defined as pneumonia that develops more than 48 hours after endotracheal intubation/mechanical ventilation or pneumonia that continues to develop even after extubation.[1,2]

VAP is the most common ICU-acquired infection among mechanically ventilated patients.[3] VAP is a type of hospital-acquired pneumonia. It affects 9-27 percent of mechanically ventilated patients.[4] In ICU patients with ventilator associated pneumonia in India, the total crude death rate is 67.4 percent, accounting for 40 percent of the mortality.[5]

VAP is becoming a global health problem that threatens many medical advances of the last century. Antimicrobial resistance in the intensive care unit (ICU) has been dubbed as the ‘‘epicentre of infections’‘ in the healthcare industry. In the ICU, ventilator-associated pneumonia (VAP) is a leading cause of death.

The most common organism causing ventilator-associated pneumonia (VAP) are, Pseudomonas aeruginosa, Acinetobacter species, Klebsiella pneumoniae, Enterobacter species and MRSA (methicillin Resistant Staphylococcus aureus). The emergence of ESBL (Extended spectrum beta lactamases), Amp C beta lactamases, and Metallo-beta lactamases by Pseudomonas and Acinetobacter species results in multidrug resistance.[4]

Thus, VAP poses serious problems in endotracheally intubated patients in ICUs across the world. It has a negative impact on clinical outcomes, prolongs hospital stay and raises healthcare expenses.[3] VAP can be caused by a variety of

factors, including the type of critical care unit and the type of patient. Because of this, all clinical environments should be investigated for the presence of VAP associated microorganisms and their sensitivity patterns to guide the appropriate and effective administration of antimicrobial drugs. Many patients at our tertiary care hospital get mechanical ventilator assistance on a regular basis.

Antibiotic susceptibility patterns of the pathogens that cause VAP will be determined in this investigation. This study's findings can help clinicians determine which antibiotics are most likely to be effective in the presence of VAP-causing microbes.

OBJECTIVE

Objective

1. To determine sensitivity and resistance pattern of organism causing VAP.

2. To determine clinical profile of patients with VAP.

REVIEW OF LITERATURE

Pneumonia are frequently categorized based on site of acquisition. Hospital acquired (or nosocomial pneumonia) is that which occurs 48hrs or more after admission and did not appear to be incubating at the time of admission. VAP is a type of pneumonia that develop ≥48hrs after endotracheal intubation.

Ventilator-associated pneumonia (VAP) is a type of hospital-acquired pneumonia (HAP) that develops after more than 48 hours of mechanical ventilation.[6] In the critical care unit, VAP is a prevalent and dangerous problem that has been related to an increased risk of death.. As soon as feasible, the right therapy can begin, while avoiding antibiotic misuse and, consequently, the development of antibiotic resistance.

Patients with severe HAP who require mechanical ventilation after infection onset do not meet the VAP definition. This condition is known as ventilated hospital-acquired pneumonia (VHAP). VHAP's microbiology, diagnostic evaluation, and outcomes, on the other hand, are more similar to VAP than HAP.[6–9]

Term	Definition
Classification by site of acquisition	
Community-acquired pneumonia (CAP)	Acute pulmonary parenchymal infection obtained outside of a health-care environment.
Nosocomial pneumonia	An acute infection of the pulmonary parenchyma acquired in hospital settings, which encompasses hospital-acquired pneumonia and ventilator-associated pneumonia
Hospital-acquired pneumonia (HAP)	Pneumonia acquired ≥48 hours after hospital admission; includes both HAP and VAP
Ventilator-associated pneumonia (VAP)	Pneumonia acquired ≥48 hours after endotracheal intubation

Health care-associated pneumonia (HCAP)	Retired term, which referred to pneumonia acquired in health care facilities (eg, nursing homes, hemodialysis centers) or after recent hospitalization*
Classification by etiology	
Atypical pneumonia	Pneumonia caused by ‘‘atypical’‘¶ bacterial pathogens including , *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, *Legionella* spp, *Chlamydia psittaci*, and *Coxiella burnetii*
Aspiration pneumonia	Adverse pulmonary effects caused by the admission of stomach or oropharyngeal fluids, which may include germs and/or have a low pH, or exogenous substances (for example, ingested food particles or liquids, mineral oil, salt, or fresh water) into the lower airways.
Chemical pneumonitis	Aspiration of substances (eg, acidic gastric fluid) that cause an inflammatory reaction in the lower airways, independent of bacterial infection
Bacterial aspiration pneumonia	An active infection caused by huge numbers of microorganisms being inoculated into the lungs via orogastric contents.

The term “health care-associated pneumonia’‘ (HCAP) was added to the American Thoracic Society/Infectious Diseases Society of America (ATS/IDSA) guidelines in 2005, and it referred to pneumonia acquired in health care facilities such as nursing homes, hemodialysis centres, outpatient clinics, or during a hospitalisation within the previous three months. This category was used to identify patients who were at risk of infection with multidrug-resistant (MDR) pathogens based on their specific risk factors and illness severity.[10]

Antimicrobial resistance: The Centers for Disease Control and Prevention (CDC) in the United States and the European Centre for Disease Prevention and Control (ECDC) in Europe have created standard terminology for antimicrobial-resistant gram-negative bacilli, which are major causes of HAP and VAP.[11]

Multidrug resistant (MDR) refers to acquired non-susceptibility to at least one agent in three different antimicrobial classes.

Extensively drug resistant (XDR) refers to non-susceptibility to at least one agent in all but two antimicrobial classes.

Pandrug resistant (PDR) refers to non-susceptibility to all antimicrobial agents that can be used for treatment.

Epidemiology:

According to the National Healthcare Safety Network (NHSN) of the Centers for Disease Control and Prevention, there has been a steady decline in reported VAP rates in the United States; between 2006 and 2012, the reported incidence of VAP per 1000 ventilator-days in medical intensive care units (ICUs) decreased from 3.1 to 0.9, and in surgical ICUs, the reported incidence decreased from 5.2 to 2.0 [12,13]

Because the NHSN definition of VAP includes qualitative criteria (for example, increased secretions or worsening oxygenation), it is unclear whether the reported decrease in VAP incidence represents a true decrease or reflects stricter application of these subjective criteria.[14]

Long hospital stays and high expenses are related with VAP.[6] Two studies found that VAP increases the time of mechanical ventilation by 7.6 to 11.5 days and hospitalisation by 11.5 to 13.1 days when compared to identical patients who did not have VAP; the extra expense associated with VAP has been estimated to be over USD $40,000 per patient.[15,16]

Pathogenesis:

Microorganisms infecting the lower respiratory tract, as well as the host's response, have a role in the pathophysiology of HAP and VAP (eg, humoral,

mechanical, and cellular host defenses). The lungs are infected mostly by micro-aspiration of germs that have colonised the oropharyngeal tract (or, to a lesser extent, the gastrointestinal tract). In healthy people, about 45 percent of them aspirate as they sleep, and in critically ill people, the figure rises to about 60 percent.[17] The installation of an endotracheal tube increases the aspiration of oropharyngeal secretions and bacteria into the lungs, despite the belief that it is generally protective. Bacteria that enter the lungs can lead to pneumonia, depending on the number and aggressiveness of the organisms.[18,19]

Clinical presentation:

More than 48 hours after intubation, the majority of patients with VAP experience a gradual or sudden onset of the following symptoms.[20]

Symptoms: dyspnea

Signs:

Fever

Tachypnea,

Hemoptysis

Purulent secretion

Rhonchi

Crackles

Reduced breath sounds

Bronchospasm

Ventilator mechanics: reduced tidal volume, increased inspiratory pressure

Laboratory findings: worsening hypoxemia, leukocytosis

Microbiology:

HAP (or nosocomial pneumonia) and VAP can be caused by a wide range of infections and are polymicrobial in nature. Aerobic gram-negative bacilli (e.g., Escherichia coli, Klebsiella pneumoniae, Enterobacter spp, Pseudomonas aeruginosa, Acinetobacter spp) and gram-positive cocci are common pathogens (eg, Staphylococcus aureus, including methicillin-resistant S. aureus [MRSA], Streptococcus spp).[21,22] There is growing realisation that viruses may cause a significant proportion of nosocomial pneumonias in regular medical and surgical patients, as well as viruses and fungi in immunocompromised patients.

Methicillin-susceptible S. aureus (MSSA; 9 percent), MRSA (18 percent), P. aeruginosa (18 percent), Stenotrophomonas maltophilia (7 percent), Acinetobacter spp (8 percent), and other species were among the infecting flora in VAP patients (9 percent).

In non-ventilated patients with HAP, the infecting flora was comparable, with the exception that non-Enterobacteriaceae gram-negative bacilli (P. aeruginosa, Acinetobacter, and S. maltophilia) were less common. It specifically contained MSSA (13%), MRSA (20%), P. aeruginosa (9%), S. maltophilia (1%), Acinetobacter spp (3%), and other species (18 percent).

Risk factors for MDR:

When a patient is susceptible to MDR infections, the pathogenesis of HAP or VAP can be greatly affected. Certain MDR infections are more prevalent in some hospitals than others, as well as in different patient populations. There are two key risk factors for MDR pathogens: long-term hospitalisation and recent antibiotic exposure. Nosocomial infection susceptibility patterns must be studied in order to establish the appropriate empiric antibiotic treatment.[6]

Table 1: Risk factors for multidrug resistant ventilator associated pneumonia

Risk factors for MDR pathogens:
IV antibiotic use within the previous 90 days
Septic shock at the time of VAP
ARDS preceding VAP
Equal or more than 5 days of hospitalization prior to the occurrence of VAP
Acute renal replacement therapy prior to VAP onset
Risk factors for MDR *Pseudomonas* and other gram-negative bacilli:
Treatment in an ICU in which more than 10 percent of gram-negative isolates are resistant to an agent being considered for monotherapy
ICU Treatment in which local antimicrobial susceptibility rates are not known
Colonization with OR prior isolation of MDR *Pseudomonas* or other gram-negative bacilli
Risk factors for MRSA:
Treatment in a unit in which >10 to 20 percent of *Staphylococcus aureus* isolates are methicillin resistant
Treatment in a unit in which the prevalence of MRSA is not known
Colonization with OR prior isolation of MRSA

Diagnostic evaluation:

When imaging shows a new or growing pulmonary infiltrate, as well as clinical signs of infection, VAP should be evaluated (eg, fever, secretions, leukocytosis). The diagnosis is verified when a pathogen is found in a sample taken from the lower respiratory tract.

Computed tomography:

Chest CT is not frequently performed in patients with suspected VAP, although it may be helpful in individuals with a normal chest radiograph and clinical symptoms of respiratory tract infection (eg, patients with fever plus leukocytosis and purulent tracheobronchial secretions). It's possible that a CT scan can help pinpoint the exact location of the lobe to be sampled. There may be an increased likelihood that individuals who have had a previous CT diagnosis of pneumonia will benefit from a chest CT scan in order to look for any new or worsening anomalies, such as pleural effusion. Mechanically ventilated patients are more likely to develop pulmonary infiltrates due to a variety of reasons. VAP imaging in intensive care remains hazy due to this fact.[23–25]

Respiratory tract sampling:

Because antibiotic therapy lowers the sensitivity of both microscopic analysis and culture, respiratory samples are preferably acquired prior to the commencement of medications or modification of antibiotic therapy (in those currently receiving antibiotics).[26–28] However, it is not unusual for severe sickness or sampling delays to necessitate the administration of empiric antibiotics prior to diagnostic sampling.

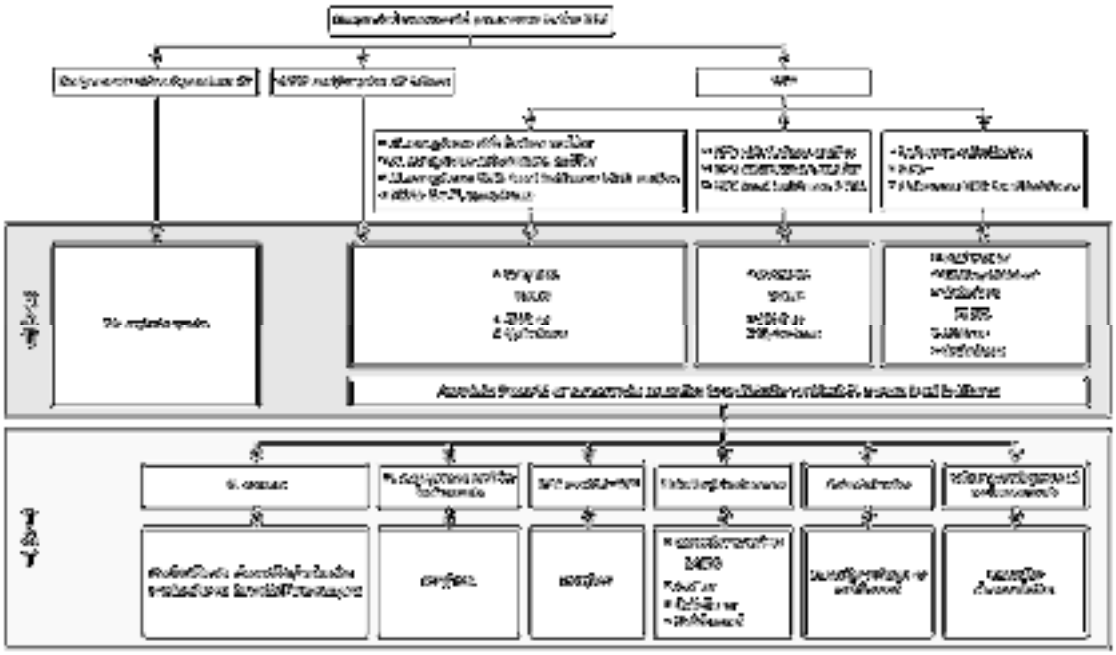

Figure 1: Suspected nosocomial pneumonia in the intensive care unit

To perform invasive sampling, non-bronchoscopic procedures (e.g., mini-BAL) or bronchoscopic approaches are typically used (eg, bronchoscopic BAL or PSB). In terms of lower respiratory tract sampling, bronchoscopy is the preferable procedure. Due to the large sample size and little airway contamination, this method is a viable alternative to PSB (and possibly mini-BAL). It has been established in several studies that bronchoscopy can decrease antibiotic abuse and reduce the time it takes for antimicrobial therapy to be de-escalated, without altering mortality or length of stay (endotracheal aspirates).[29,30]

Mini-BAL is performed by blindly advancing a catheter through the endotracheal tube until resistance is met, then infusing sterile saline through the catheter (typically three 50 mL aliquots), and aspirating with the syringe (the catheter is estimated to be located in the distal endobronchial airway (eg, second or third order bronchus).

Microscopic analysis and quantitative culture:

All respiratory tract samples should be sent for microscopic analysis and our preference is that quantitative cultures be obtained:

Other cell types, including polymorphonuclear leukocytes and Gram staining, are examined semi-quantitatively during microscopic examination. Microscopy results are not diagnostic of VAP, but they come before cultures and can assist in identifying a probable infection and adjusting antibiotics to that organism.[31] Bacterial morphology may signal a possible pathogen in the presence of a large number of neutrophils in the blood (eg, Gram-negative rods). All 39 BAL patients with neutrophils less than 50% of the total nucleated cells had VAP removed in a prospective cohort investigation.

Quantitative culture: Bacteria may be enumerated on any respiratory samples using quantitative cultures. When a certain level of bacterial growth is reached, VAP is activated.[32] Only pulmonary pathogen bacteria should be counted. Staphylococcus epidermidis and most Gram-positive bacilli (excluding actinomycosis and nocardia) are examples of organisms that should not be counted.

Typical thresholds include the following:

- Endotracheal aspirates – ≥1,000,000 colony forming units (cfu)/mL
- Bronchoscopic- or mini-BAL – 10,000 cfu/mL
- PSB – 1000 cfu/mL

These thresholds are considered sufficiently high that patients with tracheobronchial colonization are unlikely to be mistakenly detected as having VAP. Most labs do not routinely perform quantitative cultures unless specifically requested. Qualitative and semi-quantitative cultures are frequently regarded to be more time consuming and expensive than quantitative cultures.

Anaerobe quantification normally follows the same guidelines, but it takes longer and requires particular laboratory skills, therefore only a few facilities do it.

Non-invasive respiratory sampling:

A catheter is advanced into the trachea or main stem bronchus until resistance is encountered, and suction is then administered to the endotracheal tube (ie, endotracheal aspiration). For microbiologic examination, specimens are aspirated directly into a sterile specimen trap.

Lung biopsy criteria:

Lung biopsy is rarely used in patients with suspected VAP due to the fact that lower respiratory tract samples and cultures are more commonly used in the diagnosis of VAP. If an individual's infiltrates persist despite antibacterial medication, or if the aetiology is suspected to be non-infectious, a lung biopsy may be warranted. Under these conditions, it is hoped that pathogens that are difficult to proliferate (e.g., fungi, herpes viruses) will be found or that a noninfectious process masquerading as infection will be discovered (eg, cancer, cryptogenic organising pneumonitis, lymphangitis, interstitial pneumonitis, vasculitis).

Polymerase chain reaction technique role:

Molecular approaches have emerged to aid in the fast detection and antibiotic therapy of infections, including VAP, in patients with pneumonia.[33] However, they aren't done very often, and the interpretation of the results can be a challenge. For the identification of microbial DNA, polymerase chain reaction (PCR) is a fast and low-cost approach. It is advantageous in severely ill patients with a big list of potential pathogens to do multiple PCR assays at the same time.

PCR techniques can be used to swiftly identify specific bacteria in respiratory samples, allowing for both empiric antibiotic treatment and subsequent modification.

Rapid and precise identification of microorganisms in patients with suspected VAP can be achieved using commercially available multiplex PCR technology. More research is needed to help doctors decide when and how to use PCR.

Diagnosis:

VAP is a clinical diagnosis made in a patient who has been mechanically ventilated for ≥48 hours who develops a new or progressive lung infiltrate on imaging with clinical evidence that the infiltrate is of infectious origin (eg, fever, purulent sputum, leukocytosis, and decline in oxygenation), together with a positive pathogen identified on microbiologic respiratory sample.[6]

Staphylococcus aureus, Pseudomonas aeruginosa, and other gram-negative bacilli are common pathogens recovered from VAP patients. At 2016, the Clinical Trials Transformation Initiative (CTTI) conducted a prospective trial in US hospitals. The VAE system is a three-tiered monitoring definition that uses objective, publicly available data to identify problems, such as VAP, in mechanically ventilated adult patients.

Ventilator-associated condition (VAC) – The first tier definition, VAC, identifies patients with a period of sustained respiratory deterioration (changes in positive end-expiratory pressure [PEEP] ≥3 cm H2O or fraction of inspired oxygen [FiO2] ≥0.2 [ie, 20 points] for two days) following a sustained period of stability or improvement on the ventilator (greater than or equal to two days)

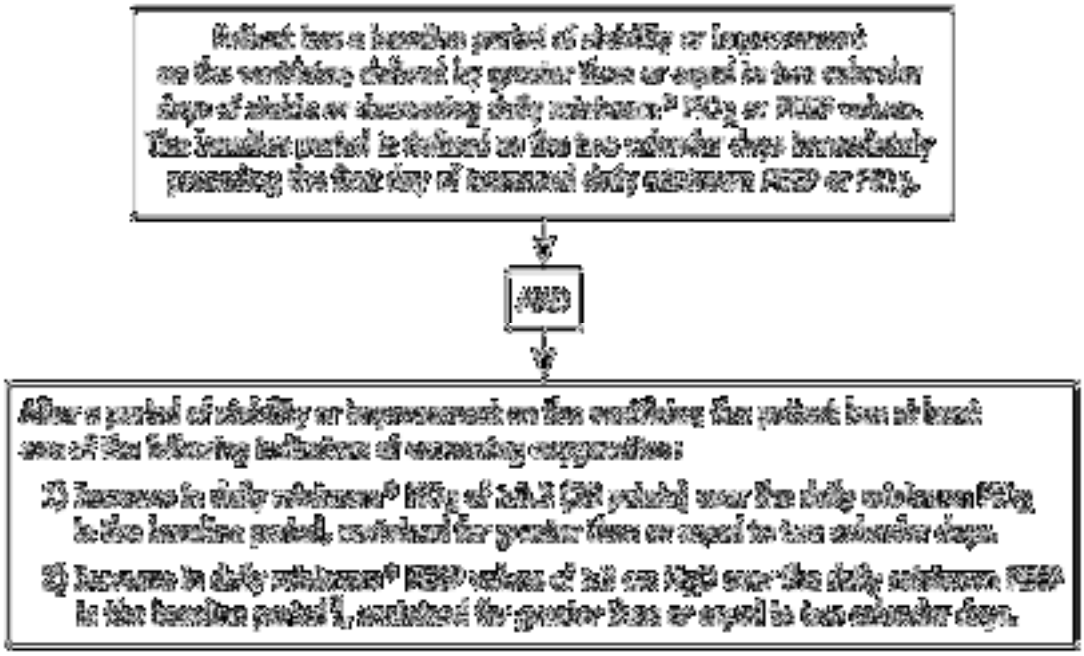

Figure 2: Ventilator associated condition

Infectio-related ventilator-associated complication (IVAC) – IVAC is an abbreviation for infection-related ventilator-associated complication. The second tier definition, IVAC, requires individuals with VAC to have an aberrant temperature (below 36°C or over 38°C) or white blood cell count (≤4000 or ≥12,000 cells/mm3), as well as to be put on one or more new antibiotics that last four days or longer.

Figure 3: Infection related ventilator associated complication (IVAC)

Potential and likely VAP — Possible and probable VAP classifications necessitate IVAC patients to have evidence of respiratory illness in the laboratory and/or microbiology. Possible VAP in IVAC patients with gram stain evidence of purulent pulmonary secretions or a pathogenic lung culture.

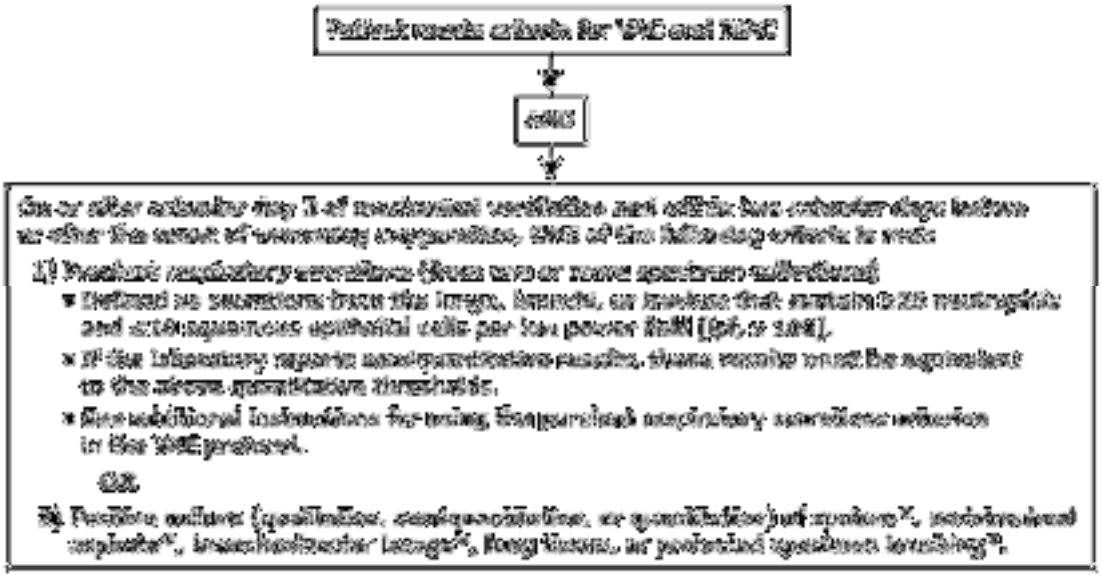

Figure 4: Possible ventilatory associated pneumonia (VAP).

CLINICAL PULMONARY INFECTION SCORE (CPIS) evaluates data in patients with suspected VAP and stratified the risk of positive diagnosis.It consists of six variables depending on patients data total score is calculated

Clinical pulmonary infection score (CPIS)*[37] .

Sign	Point (s)
Temperature ^{0}C	
➢ 36.5 – 38.4	0
➢ 38.5 – 38.9	1
➢ ≤ 36 or ≥ 39	2
Blood leukocytes, cells/μL	
➢ 4000-11000	0
➢ <4000 or > 11000	1
➢ > 500 Band forms	2
Oxygenation, Pao_2/Fio_2	
➢ >240 or ARDS	0
➢ ≤240 and no evidence of ARDS	2
Pulmonary radiography	
➢ No infiltrate	0
➢ Diffuse (or patchy) infiltrates	1
➢ Localized infiltrate	2
Tracheal secretions	
➢ Score †	
< 14	0
≥14	1
➢ Purulent sputum	2
Culture of tracheal aspirate	
➢ Pathogenic bacteria cultured minimal or no growth	0
➢ Pathogenic bacteria cultured moderate or greater growth	1
➢ Moderate or greater growth of pathogenic bacteria consistent with that seen on original Gram stain	2

Abbreviation : ARDS, acute respiratory distress syndrome.
*Total score of > 6 points suggests ventilator – associated pneumonia.
†Score calculated by quantifying amount of tracheal secretions on a subjective 0-4

Score varies from 0 to 12 where 0 means normal functioning and 12 means high risk or probability of VAP.A CPIS score of greater than 6 has good correlation with presence of VAP.

Articles reviewing the pattern of antimicrobial resistance among the patients with VAP.

In a prospective observational study by Patil HV et al., to assess the incidence, bacteriology and clinical outcome related to VAP. A total of 126 bacterial isolates were discovered in 74 VAP patients. Gram-negative isolates predominated 52. (70.27 percent). A total of 41 patients (55.40 percent) had polymicrobial VAP, whereas 33 (44.59 percent) had a single isolate. MDR organisms were found in 55 (43.65%) of the isolates. A total of 22 VAP patients died during therapy, for an overall case fatality rate of 29.72 percent. There were 13 (26.63 percent) Klebsiella spp., 11 (20 percent) Pseudomonas aeruginosa, 14 (25.45 percent) Acinetobacter, 8 (14.54 percent) Escherichia coli, and 9 (16.36 percent) coagulase positive Staphylococcus aureus among the 55 MDR isolates in VAP. Among MDR isolates, 12 patients (21.41 percent) died. Late-onset VAP has a significant prevalence of MDR pathogens. Klebsiella, Pseudomonas E. coli, and Acinetobacter were the most often identified Gram-negative pathogens with significant death rates.[34]

In study by Chaudhury A et al. showed significant growth of pathogens (mono or polybacterial) was found in 247 of 1159 (21.3%) patients in 2011, 297 of 903 (32.9%) in 2012 and 303 of 1022 (29.6%) in 2013. The VAP rates were 44.1, 43.8 and 26.3 per 1000 ventilator days in the three years, respectively. The total numbers of Gram-negative organisms isolated in the three years from 2011 to 2013 were 578, 737 and 512, respectively. In all the three years, non-fermentative Gram-negative bacilli were the predominant organisms, followed by *Pseudomonas* spp. and *Klebsiella* spp. Although the relative frequency of most of these organisms remained more or less the same over the years, a small incremental decrease in the number of *Klebsiella* spp. (23.7% in 2011 to19.3% in 2013) and *E. coli* (14.9-11.5% during the same period) were noted over the years. Amongst the Gram-positive

isolates, *S. aureus* exhibited a downward trend in prevalence from 50.0 per cent in 2011 to 34.9 per cent in 2013. It was concluded that the prevalence of multidrug-resistant microorganisms was increasing. The resistance pattern of these infections can assist a facility in developing an efficient antimicrobial policy.[35]

According to a research based on marginal structural modelling, the (sub distribution) hazard of ICU mortality rose 2.3 percent for each extra day following the commencement of VAP (hazard ratio [HR], 1.023; 95 percent confidence interval [CI], 1.011–1.034; P 0.001). For correctly vs poorly treated VAP, HRs increased by 2.0 percent (HR, 1.02; 95 percent CI, 1.007–1.034; P = 0.003) and 2.7 percent (HR, 1.027; 95 percent CI, 1.017–1.047; P = 0.001). The effect of VAP on ICU mortality was further influenced by the severity of the patient's disease at the time of ICU admission.[10]

58.3% of the instances of VAP and its associated risk factors were late-onset, while 41.7 percent were early-onset, in a prospective research by Joseph NM et al. VAP was found to be linked with tracheostomy, re-intubation, emergency intubation, and a nasogastric tube in a single-variable study. Early-onset VAP was revealed to be specifically associated with emergency intubation and intravenous sedatives, while late-onset VAP was found to be independently associated with tracheostomy and re-intubation by multivariate logistic regression analysis.[36]

The frequency, danger, and prognosis of nosocomial pneumonia in patients on ventilators were studied by Torres A et al. A previous episode of aspiration of gastric contents, an MV period longer than three days, the presence of chronic obstructive pulmonary disease (COPD), and the use of positive end-expiratory pressure (PEEP) during MV were all found to be significantly associated with an increased risk of ventilator-associated pneumonia in multivariate analysis. Stepwise logistic regression

analysis determined that the prognosis was adversely affected by the presence of an ultimately or rapidly fatal underlying disease, acute respiratory failure exacerbated by pneumonia, septic shock, an inappropriate antibiotic treatment, and the type of intensive care unit hospitalisation (noncardiac surgery and nonsurgical ICU compared to postcardiac surgery ICU). There were 23 people killed in total. Those who have NP had a greater death rate than those who didn't have it. In 36 of the instances, an etiologic agent was identified (46 percent).[37]

In study by Ahsan ASM et al., to assess the antibiotic resistance pattern among the bacteria causing ventilator associated pneumonia. Gram-negative organisms (76.13 percent) were the most often isolated species, followed by fungus (17.04 percent) and gram-positive cocci (6.81 percent). Acinetobacter sp. was the most frequent pathogen, followed by Klebsiella sp., Candida sp., and Pseudomonas sp. Acinetobacter sp., Klebsiella sp., and Pseudomonas sp. were extremely resistant (>80%) to third generation cephalosporins and fluoroquinolones among the gramme negative pathogens. Resistance to aminoglycosides (>68%) and imipenem (>60%) was also prevalent. Pseudomonas sp. resistance to piperacillin-tazobactum was lower (18.2 percent) when compared to Acinetobacter sp. and Klebsiella sp. The researchers found that the emergence of treatment resistance against the bacterium causing VAP is a severe worry in the majority of ICUs. Knowing the antibiotic susceptibility pattern can help you avoid illogical antibiotic usage in order to prevent the spread of illness and manage VAP properly. [38]

The incidence of VAP and the bacterial resistance patterns of adults were examined in a study by Afkhamzadeh AR and colleagues. Enterobacteriacae, including Klebsiella spp, Enterobacter spp, and E.coli, were the most common germs detected in the endotracheal tube. As for Acintobacter spp. and Staphylococcus

aureus, they were found in three, two, and one samples apiece, respectively. Cefazolin and amikacin had the highest and lowest antibiotic resistance rates among gram-negative bacteria, respectively. Rapid response is needed due to the 32.2 percent incidence of VAP. Antibiotic resistance was particularly high among the clinical isolates studied in this investigation, particularly against cephalosporins of the third generation. In order to avoid VAP, infection control rules must be followed closely. [39]

MATERIALS AND METHODS

Source of data: Study conducted in intensive care unit at K.L.E.S Dr. Prabhakar Kore Hospital and medical research centre, Belagavi

7.2 Methods of collection of data:

Study design: It is a one year cross sectional study.

Study period: 1st January 2020 to 31stDecember 2020

Place of study: intensive care unit at K.L.E.S Dr.Prabhakar Kore Hospital and medical research centre, Belagavi.

Sample size:

Sample size formula:

The minimum sample size formula based on prevalence is

$$n = \frac{z_\alpha{}^2 P(1-P)}{d^2}$$

where P is the percentage of prevalence and d is the percentage likely difference in the prevalence.

z_α is linked with the level of significance. For 5% level of the significance $z_\alpha = 1.96$.

Ref:

With P = 35% and d = 25% of P = 8.75%, the sample size is 65.

Inclusion Criteria:

- Patients admitted in intensive care unit(ICU)
- Patients on Invasive mechanical ventilation developing pneumonia after 48 hours of iniation of mechanical ventilation
- Patients with more than 18 years

Exclusion criteria:

- Suffering from pneumonia on admission or during first 48 hours of mechanical ventilation.
- Intubation done in other hospital
- Age less then 18 years

Methodology:

All patients those who developed VAP in ICU during the study and qualifying the inclusion criteria were investigated clinically, radiologically and on microbiological basis

- Clinical history and examination- relevant clinical history with symptoms of the patients was noted
- Total count was collected after 48 hours of mechanical ventilation of the patients
- Chest X ray antero-posterior (AP) view was taken after 48 hours of mechanical ventilation.
- Endotracheal Tube Aspirate was collected Culture sensitivity was noted
- CPIS score was calculated after 48 hours of mechanical ventilation score of more then 6 is indicative of VAP.

Clinical pulmonary infection score (CPIS)*[57] :

Sign	Point (s)
Temperature ^{0}C	
➢ 36.5 – 38.4	0
➢ 38.5 – 38.9	1
➢ ≤ 36 or ≥ 39	2
Blood leukocytes, cells/μL	
➢ 4000-11000	0
➢ <4000 or > 11000	1
➢ > 500 Band forms	2
Oxygenation, Pao_2/Fio_2	
➢ >240 or ARDS	0
➢ ≤240 and no evidence of ARDS	2
Pulmonary radiography	
➢ No infiltrate	0
➢ Diffuse (or patchy) infiltrates	1
➢ Localized infiltrate	2
Tracheal secretions	
➢ Score †	
< 14	0
≥14	1
➢ Purulent sputum	2
Culture of tracheal aspirate	
➢ Pathogenic bacteria cultured minimal or no growth	0
➢ Pathogenic bacteria cultured moderate or greater growth	1
➢ Moderate or greater growth of pathogenic bacteria consistent with that seen on original Gram stain	2

Abbreviation : ARDS, acute respiratory distress syndrome.
*Total score of > 6 points suggests ventilator – associated pneumonia.
†Score calculated by quantifying amount of tracheal secretions on a subjective 0-4

STATISTICAL ANALYSIS

Since the study is of observational study the plan of analysis was followed

The mean and standard deviation were determined for the continuous quantitative variables. If the data is separated into two groups based on a certain qualitative trait, the continuous variables were compared using appropriate statistical methods, such as the student's unpaired t test.

Discrete variables were represented by median.

Rates, ratios, and percentages were used to express categorical data. Chi-square test, test of proportion, or Fisher's exact test were used to examine the relationship between the outcome, clinical and demographic factors.

For discrete variables nonparametric tests was used.

ANOVA, correlation, regression, and other appropriate tools were employed in addition to those already mentioned. The contrast was shown through the use of appropriate graphs. P less than 5% (0.05) was judged significant in all of the tests. SPSS v21 on Windows 10 was used for the statistical analysis.

RESULTS

Total of 70 patients included in the present study, after fulfilling the inclusion criteria. The mean age of participants was found to be 49.33±16.46yrs of age, with majority of patients in the age group of 40-60yrs of age.

Table 1: Mean age of patients in the present study

	N	Minimum	Maximum	Mean	SD
Age in years	70	20	84	49.33	16.46

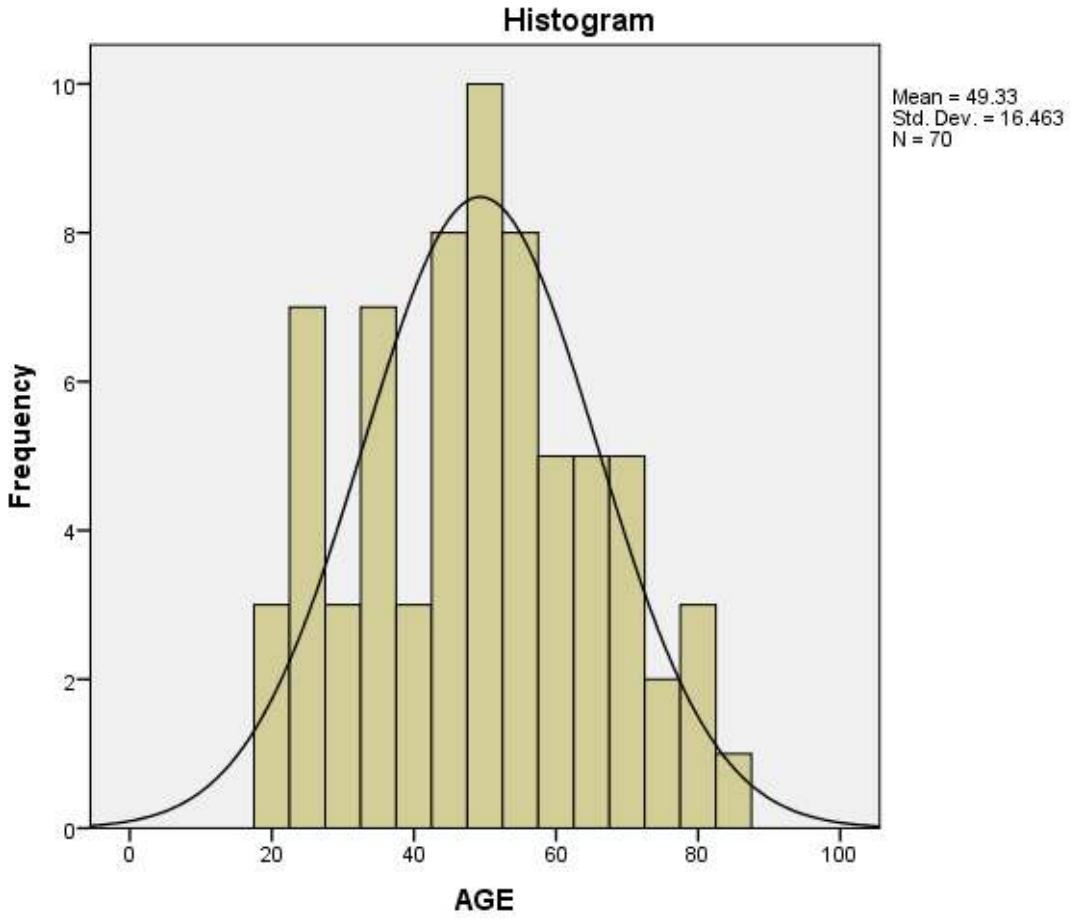

Figure 1: Showing the histogram of age wise distribution

Table 2: Showing the distribution of gender

		Frequency	Percent
Gender	Female	11	15.7
	Male	59	84.3
	Total	70	100.0

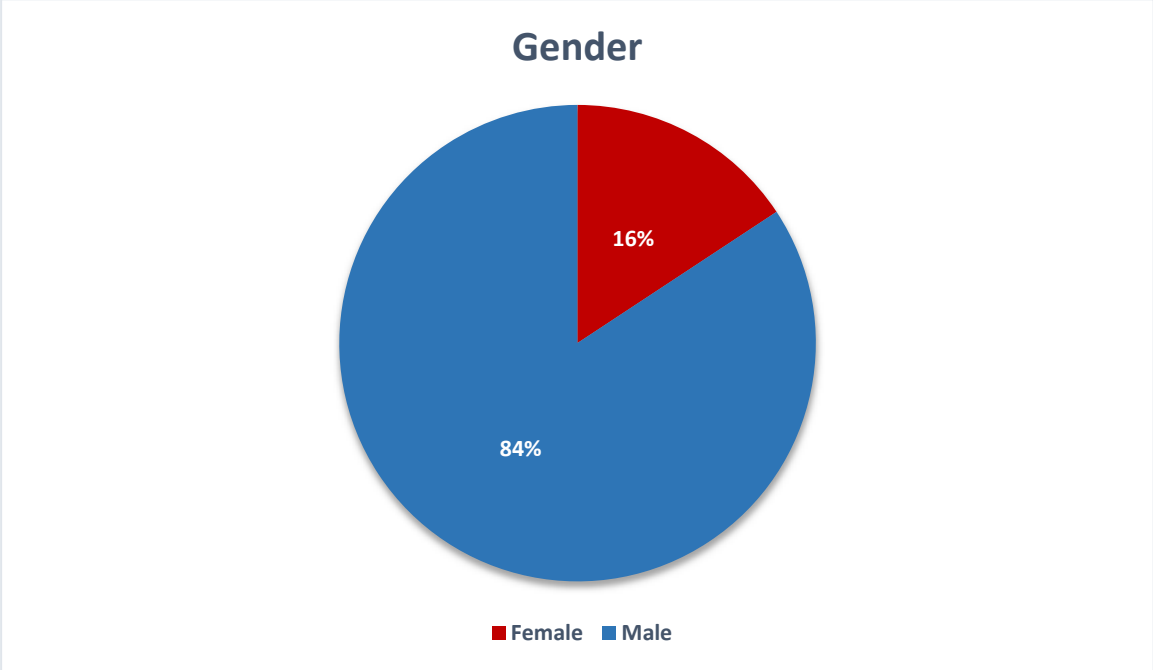

Figure 2: Showing the distribution of gender

In present study, male preponderance is noted with 84.3% male and 15.7% were female patients, and male to female ratio of 6:1.

Table 3: Showing the clinical features of patients included

Clinical features	Frequency	Percentage
Fever	45	64.2
Tachycardia	42	60
Tachypnea	38	54.2
Bronchial breath sound	20	28.5
Crepitation	36	51.42
Rhonchi	26	37.14
Increased tracheal secretions	39	55.7
Hypotension	25	35.71

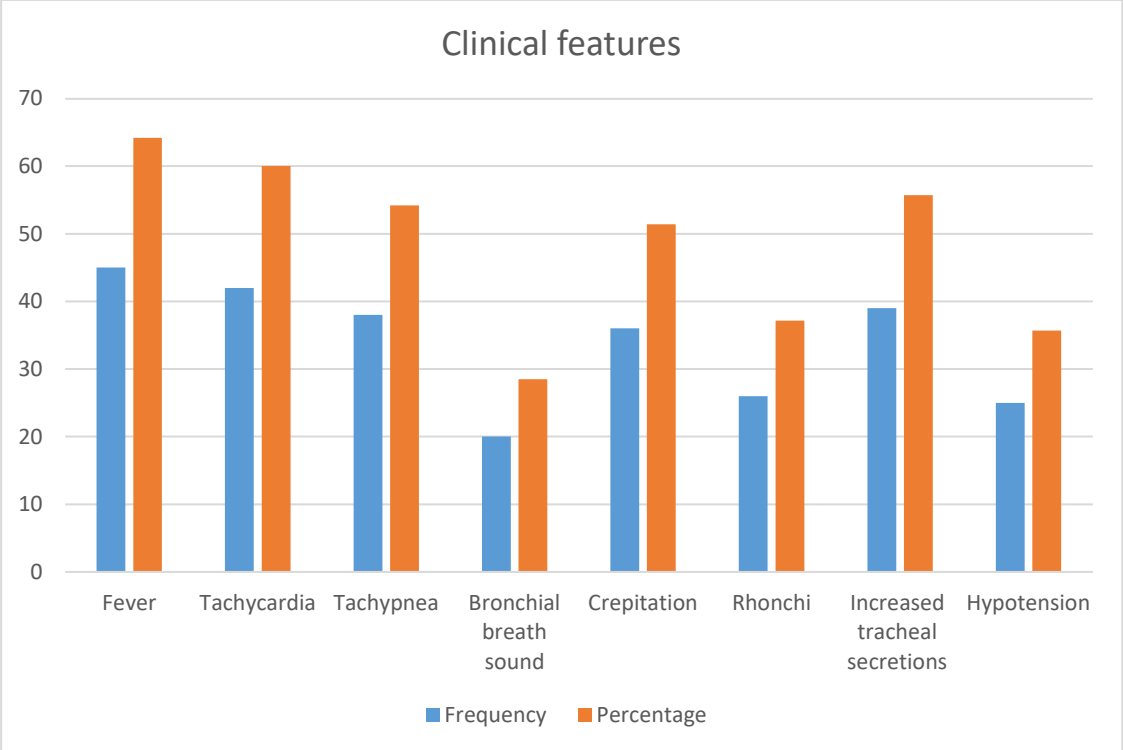

Figure 3: Showing the clinical features of patients included

Table 4: Showing the various clinical outcome of the patients included

		Frequency	Percent
Outcome	Expired	10	14.3
	Improved	60	85.7
	Total	70	100.0

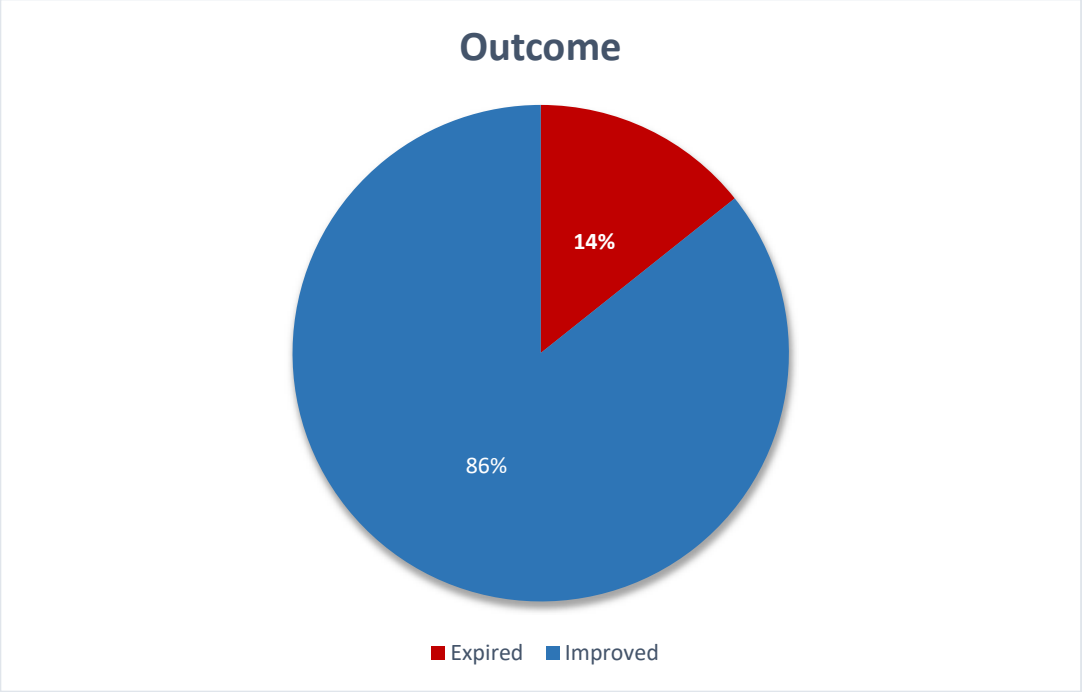

Figure 4: Showing the various clinical outcome of the patients included among the outcome of the patients, 85.7% showed the improvement and 14.3% expired

Table 5: Showing the distribution of the type of patients included in the study

		Frequency	Percent
Type of patient	MICU	11	15.7
	NM	26	37.1
	NS	31	44.3
	SICU	2	2.9
	Total	70	100.0

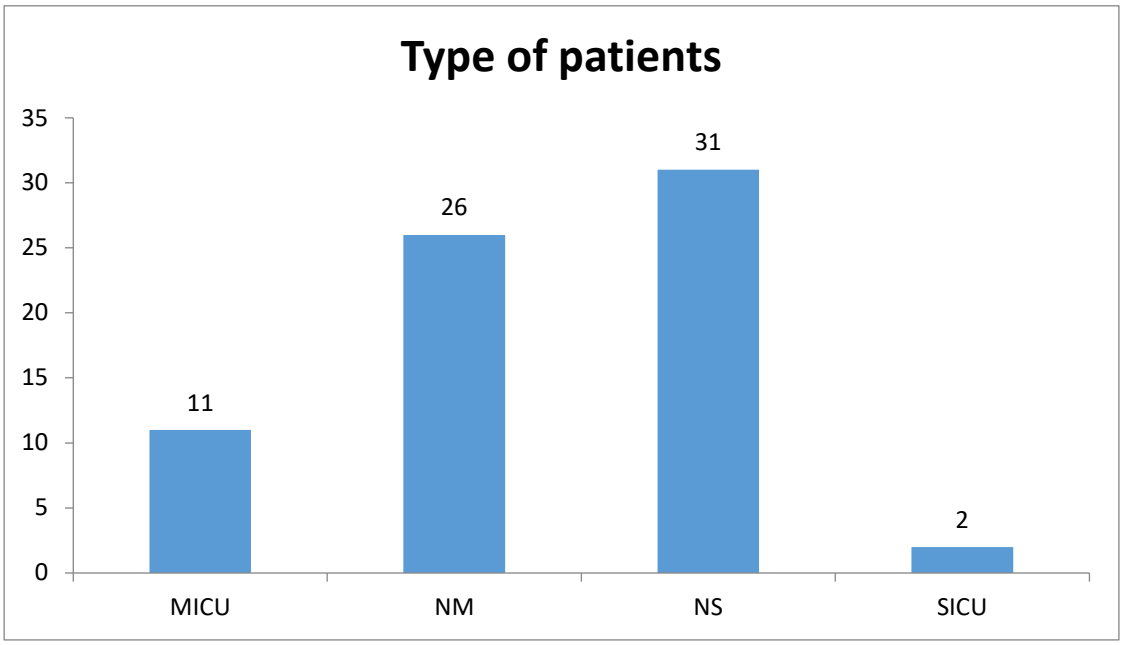

Figure 5: Showing the distribution of the type of patients included in the study

All the samples for the study were received from various critical care units, among them majority were from Neurosurgical ICU(NS) (44.3%), followed with 37.1% from Neuromedicine (NM), 15.7% from medical ICU (MICU)and 2.9% from Surgical ICU (SICU).

Table 6: Showing the comorbidities among the patients included in the study

		Frequency	Percent
Comorbidities	Cancer	1	1.4
	COPD	2	2.9
	DM	9	12.9
	HTN	11	15.8
	IHD	2	2.9
	Nil	47	67.1

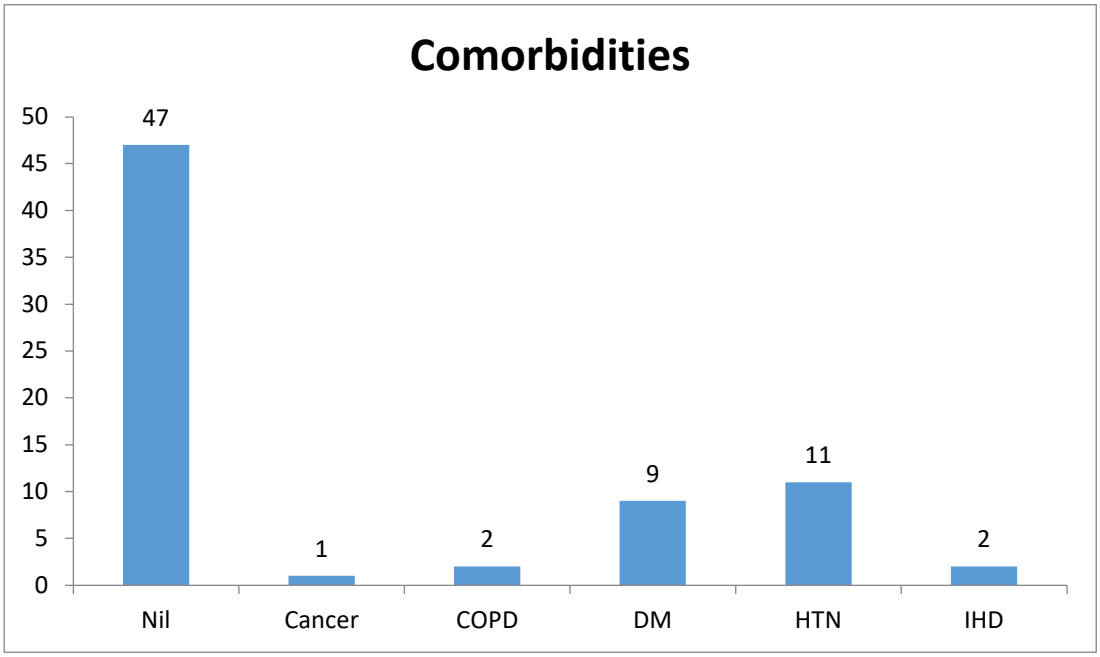

Figure 6: Showing the comorbidities among the patients included in the study

On assessment of comorbidities, among the patients, 67.1% showed no cormobidities among them, and 15.8% had hypertension and 12.9% had the diabetes mellitus.

Table 7: Showing the distribution of CPIS score among the patients with VAP

		Frequency	Percent
CPIS Scoring	6	2	2.9
	7	30	42.9
	8	24	34.3
	9	7	10.0
	10	7	10.0
	Total	70	100.0

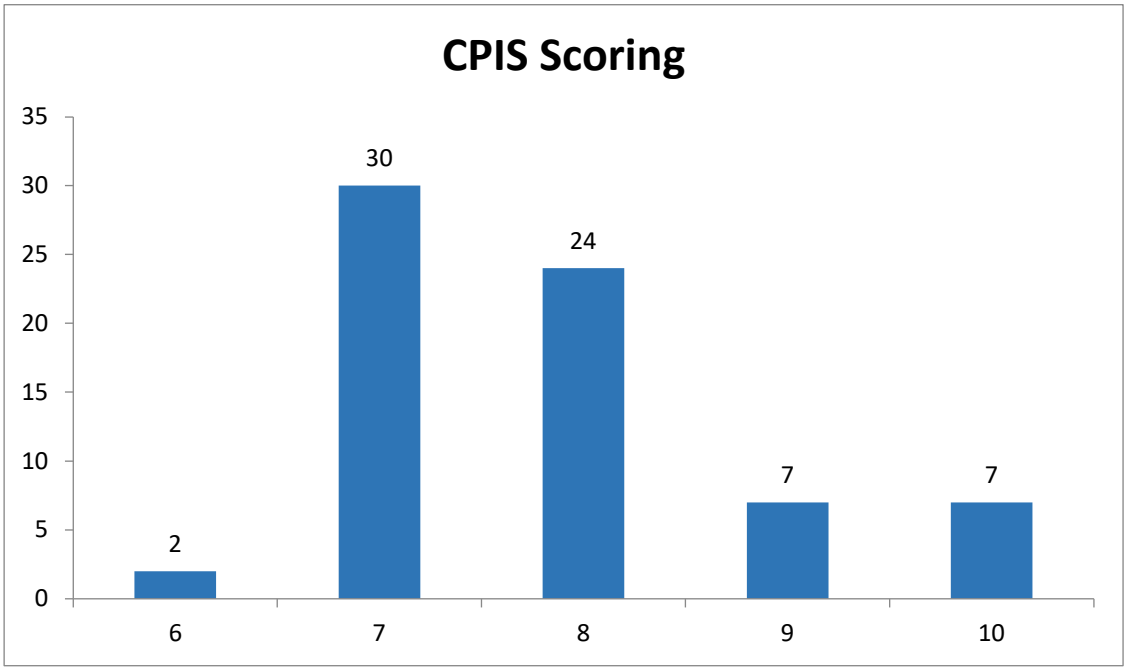

Figure 7: Showing the distribution of CPIS score among the patients with VAP

On assessment of CPIS scoring, majority were in the score of 7 (42.9%), followed with 34.3% having the score of 8 and 10% had score of 9 and 10.

Table 8: Showing the distribution of the gram positive and negative distribution

		Frequency	Percent
Gram positive or Gram negative	Negative	49	70.0
	Positive	21	30.0
	Total	70	100.0

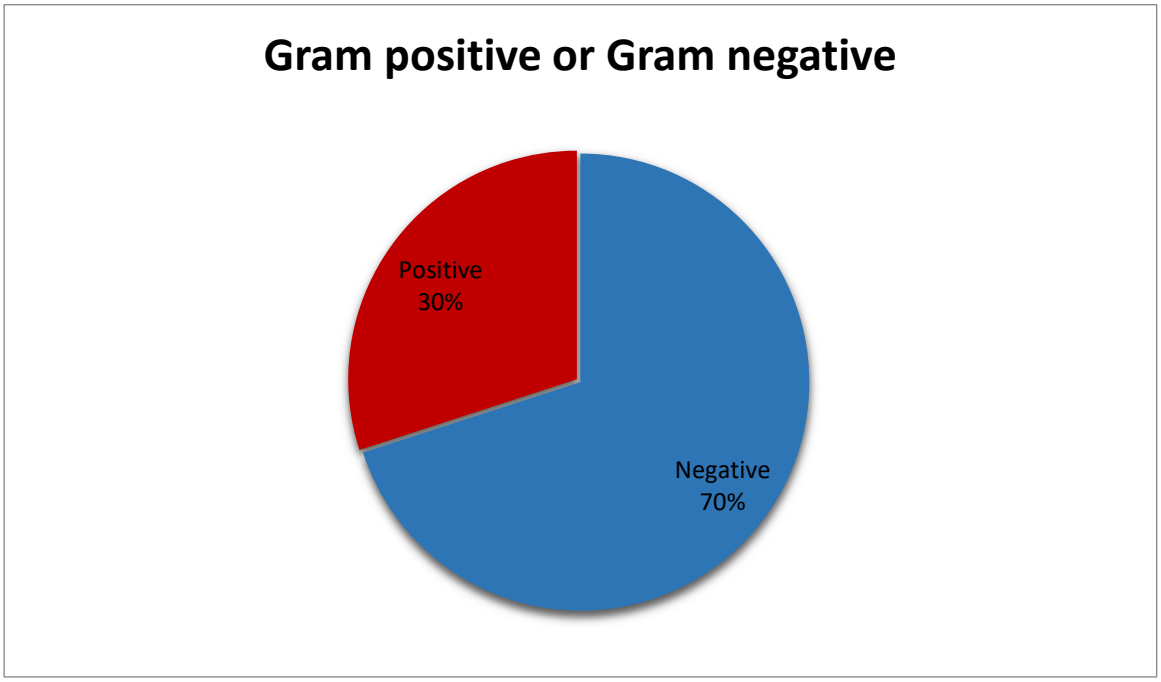

Figure 8: Showing the distribution of the gram positive and negative distribution

Among the infections seen due to ventilator associated pneumonia, 30% of them had the gram positive infections and 70% had the gram negative infections in them

Table 9: Showing the various organisms isolated from the VAP patients

	Frequency	Percent

Organism isolated	Acinetobacter baumannii	9	12.9
	CONS	6	8.6
	Enterobacter cloacae	10	14.3
	Enterococcus	2	2.9
	Enterococcus faecalis	3	4.3
	Enterococcus gallinarum	1	1.4
	Escherichia coli	3	4.3
	Klebsiella pnemoniae	19	27.1
	MRSA	2	2.9
	Pseudomonas aeruginosa	7	10.0
	Staphylococcus aureus	3	4.3
	Staphylococcus epidermidis	1	1.4
	Streptococcus bovis	2	2.9
	Streptococcus pneumoniae	2	2.9
	Total	70	100.0

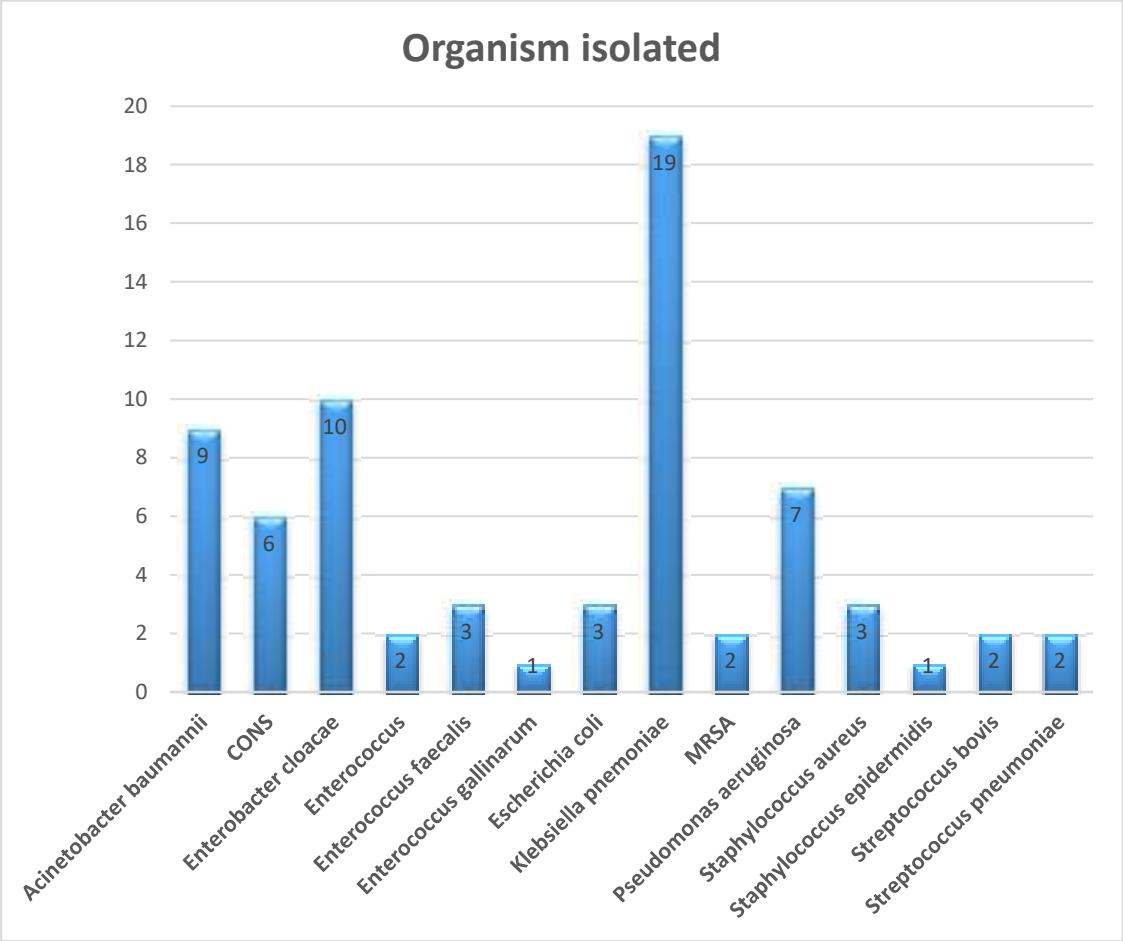

Figure 9: Showing the various organisms isolated from the VAP patients

Among the infecting organism, majority were infected with Klebsiella pnemoniae (27.1%), followed by Enterobacter cloacae (14.3%), Acinetobacter baumannii (12.9%), Pseudomonas aeruginosa (10%) and CONS in 8.6%. other less percentage infections seen were 4.3% with Enterococcus faecalis, Escherichia coli, staphylococcus epidermidis, 2.9% with streptococcus bovis, streptococcus pneumonia. MRSA and Enterococcus gallinarum in 1.4%.

Table 10: Showing the pattern antibiotic sensitivity and resistance for various drugs.

		Frequency	Percent
Amikacin	Intermediate	5	7.1
	Resistant	55	78.6
	Sensitive	10	14.3
Oxacillin	Resistant	65	92.9
	Sensitive	5	7.1
Penicllin	Resistant	65	92.9
	Sensitive	5	7.1
Ampicillin	Resistant	65	92.9
	Sensitive	5	7.1
Amoxiclav	Resistant	62	88.6
	Sensitive	8	11.4
Aztreonam	Resistant	68	97.1
	Sensitive	2	2.9
Cefoxitin	Resistant	63	90.0
	Sensitive	7	10.0
Cefepime	Resistant	64	91.4
	Sensitive	6	8.6
Cefotaxim	ESBL	2	2.9
	Intermediate	1	1.4
	Resistant	64	91.4
	Sensitive	3	4.3
Ceftazidime	ESBL	1	1.4
	Resistant	62	88.6
	Sensitive	7	10.0
Cefazolin	Resistant	68	97.1
	Sensitive	2	2.9
Cefuroxime	Intermediate	1	1.4
	Resistant	67	95.7
	Sensitive	2	2.9
Ciprofloxacin	Resistant	60	85.7
	Sensitive	10	14.3
Norfloxaxin	Resistant	68	97.1
	Sensitive	2	2.9
Levofloxacin	Intermediate	1	1.4
	Resistant	58	82.9
	Sensitive	11	15.7
Moxifloxacin	Intermediate	2	2.9
	Resistant	62	88.6
	Sensitive	6	8.6
Ertapenem	Resistant	65	92.9
	Sensitive	5	7.1
Imipenem	Resistant	59	84.3
	Sensitive	11	15.7

Meropenem	Resistant	58	82.9
	Sensitive	12	17.1
Piperacillin	Intermediate	2	2.9
	Resistant	63	90.0
	Sensitive	5	7.1
Tigecycline	Intermediate	1	1.4
	Resistant	48	68.6
	Sensitive	21	30.0
Colistin	Intermediate	1	1.4
	Resistant	58	82.9
	Sensitive	11	15.7
Chloremphenicol	Intermediate	1	1.4
	Resistant	64	91.4
	Sensitive	5	7.1
Tetracycline	Intermediate	2	2.9
	Resistant	58	82.9
	Sensitive	10	14.3
Daptomycin	Resistant	65	92.9
	Sensitive	5	7.1
Gentamycin	Resistant	54	77.1
	Sensitive	16	22.9
Vancomycin	Intermediate	2	2.9
	Resistant	62	88.6
	Sensitive	6	8.6
Clarithromycin	Intermediate	1	1.4
	Resistant	65	92.9
	Sensitive	4	5.7
Clindamycin	Resistant	62	88.6
	Sensitive	8	11.4
Netilmycin	Intermediate	1	1.4
	Resistant	65	92.9
	Sensitive	4	5.7
Trimethoprim	Resistant	58	82.9
	Sensitive	12	17.1
Linezolid	Intermediate	1	1.4
	Resistant	62	88.6
	Sensitive	7	10.0
Teicoplanin	Resistant	62	88.6
	Sensitive	8	11.4
Fosfomycin	Resistant	63	90.0
	Sensitive	7	10.0
Fusidic acid	Intermediate	2	2.9
	Resistant	64	91.4
	Sensitive	4	5.7
Rifampicin	Resistant	64	91.4
	Sensitive	6	8.6

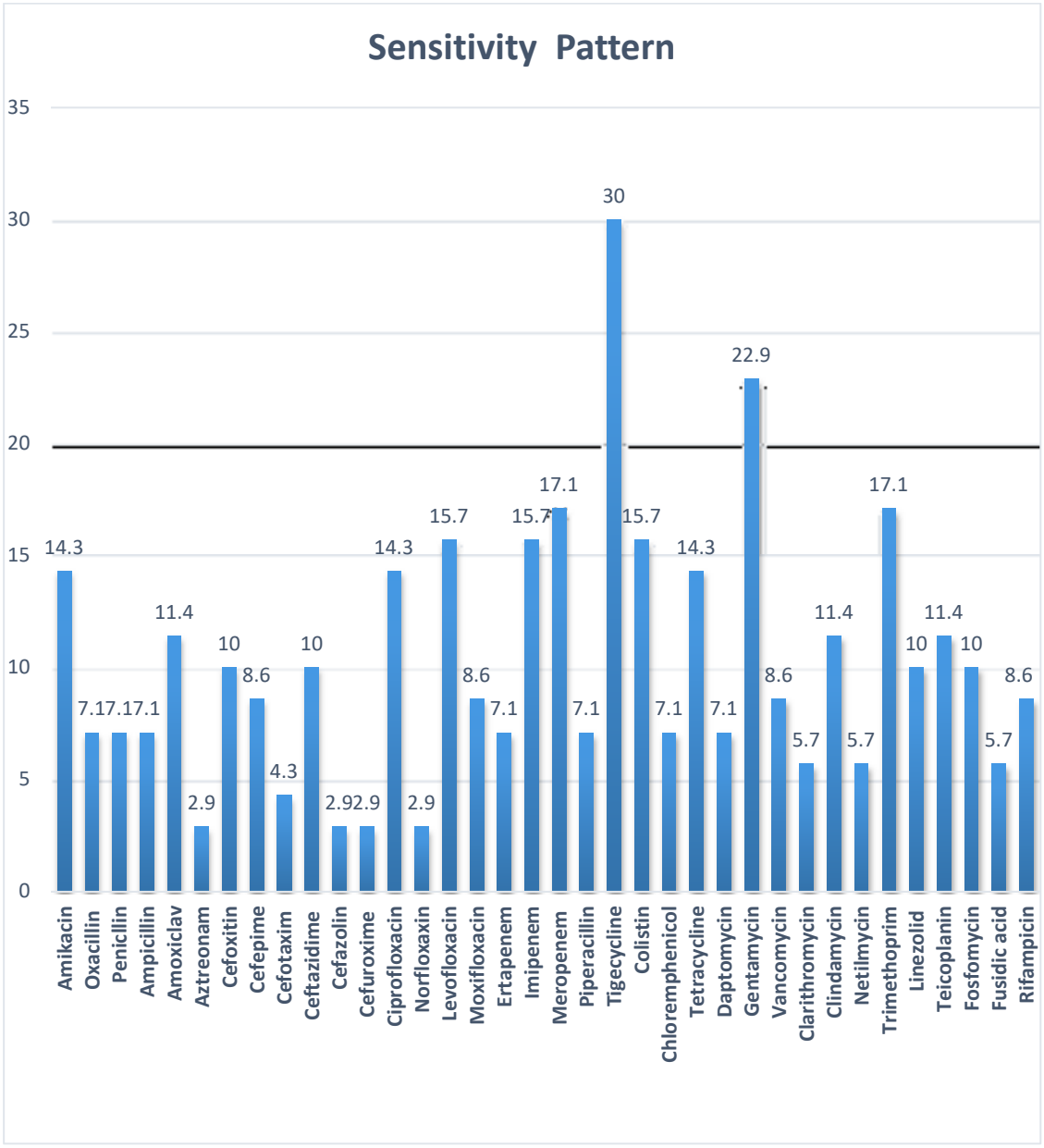

Figure 10: Showing the sensitivity for the antibiotics among VAP patients

On assessment of sensitivity profile of the antibiotics among the various patients sample, it was found that more than 30% of sensitivity was seen with Tigecycline, followed with more than 20% sensitivity to the gentamycin. Majority of other drugs were in the range of 10-20% sensitivity were openem, colistin, trimethoprim, fosfomycin, teicoplanin.

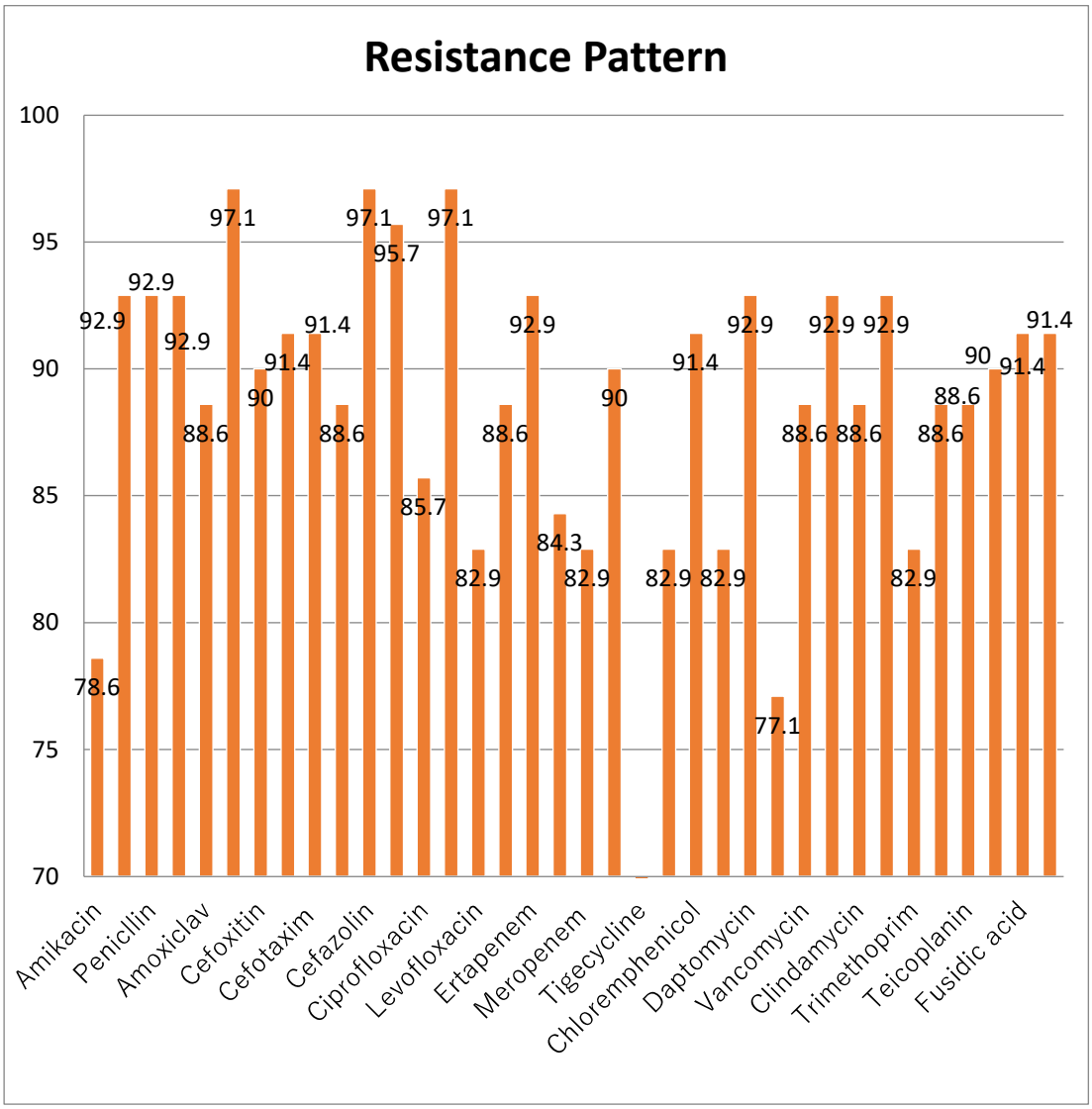

Figure 11: Showing the resistance pattern for antibiotics among VAP patients

On assessment of resistance to various antibiotics, more than 90% resistance was shown with oxacillin, penicillin, ampicillin, aztreonam, cefepime, cefotaxim, cefazolin, Cefuroxime, norfloxaxin, ertapenem, rifampicin and daptomycin.Antibiotic Showing least resistance were tigecycline, followed by gentamycin, amikacin and trimethoprim.

Table 12.Duration of Hospital stay in patients with VAP

	Maximum	Minimum	Average
Duration of Hospital stay	**50**	**4**	**20.31**

Average duration of patients suffering from VAP was 20.31 days.

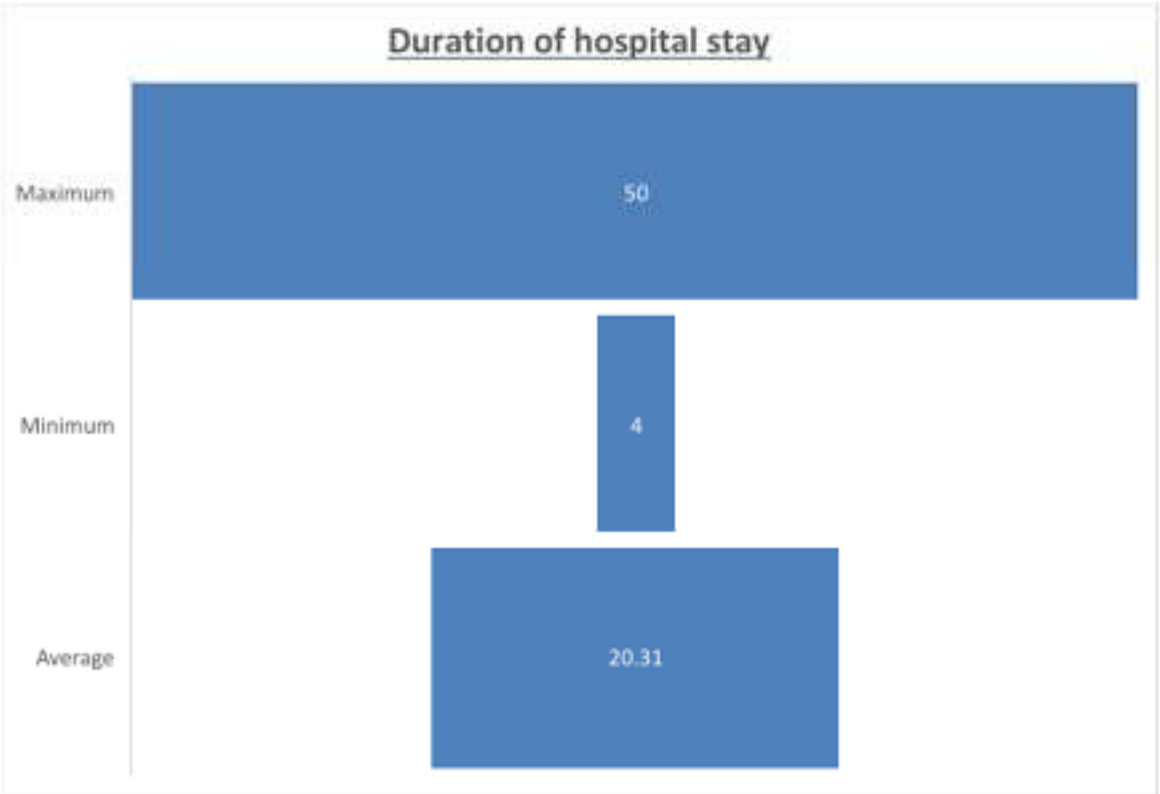

Figure 16.Showing Hospital stay of patients with VAP

Table 13.showing WBC counts in patients with VAP

WBC count in patients with VAP	Present in total patients	Percent
Leucocytosis (WBC more then 11000 cells/microL)	60	85.7
Leucopenia (WBC count less then 4400/microL)	1	1.42
Normal WBC count(4400-11000 cells/microL)	9	12.8

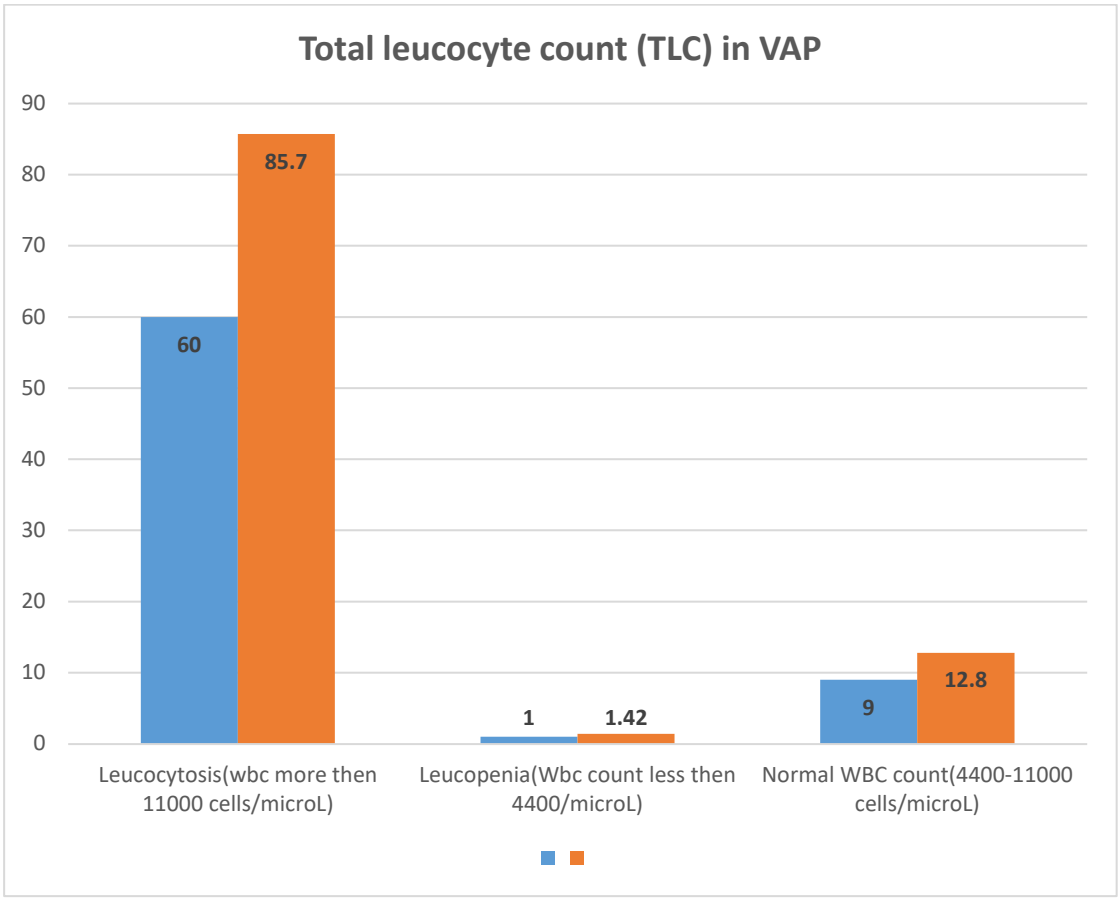

Figure 17. Showing Total leucocyte count in patients with VAP

DISCUSSION

VAP is responsible for one-fourth of all infections in critically sick patients and is the cause of half of all antibiotic prescriptions in mechanically ventilated patients. Several nations have recorded fatality rates ranging from 24% to 76%.

Study participants with ventilator-associated pneumonia were surveyed for their clinical profile and and drug sensitivity and resistance patterns. Patients that met the inclusion criteria were enrolled in this trial, which included a total of 70 participants.

The mean age of participants was found to be 49.33±16.46yrs of age, with majority of patients in the age group of 40-60yrs of age. In our study, we have seen male preponderance with 84.3% were male and 15.7% were female patients, with male to female ratio of 6:1. In similar to present study, Patil et al., documented that there is male preponderance with male to female ratio of 3:1. The mean age of patients in their study was found to be 49±14yrs.[34]

Fever was found to be the most common presenting symptom in 64.2% of cases, followed by tachycardia(60%) increased tracheal secretions (55.7%), crepitations (51.42%),rhonchi(37.14) hypotension (35.71%) and bronchial breath sounds (28.5).in the remaining cases. 15.7 percent of patients were found to have Leucocytosis after further testing. Leucocytosis was present in 85.7% patients with VAP. Average duration of Hospital stay of patients suffering from VAP was 20 Days.

85.7 percent of the patients exhibited improvement, while 14.3 percent died as a result of the disease. Sixty-one percent of those studied were found to have no comorbidities, with 15.8% suffering from hypertension and 12.9% suffering from diabetes mellitus. There were 42.9 percent of CPIS scorers in the 7-score range, followed by 34.3 percent in the 8-score range, and 10 percent in the 9- and 10-score

range.Use of corticosteroids, past use of antibiotics, incorrect empirical antimicrobial treatment, and a mixed/polymicrobial aetiology were all risk factors for VAP in the MDR group.[40]

Among the patients with ventilator associated pneumonia, 30% of them had the gram positive infections and 70% had the gram negative infections in them.

Among the infecting organism, majority of the patients were infected with Klebsiella pnemoniae (27.1%), followed with Enterobacter cloacae (14.3%), Acinetobacter baumannii (12.9%), Pseudomonas aeruginosa (10%) and CONS in 8.6%. other less percentage infections seen were 4.3% with Enterococcus faecalis, Escherichia coli, staphylococcus epidermidis, 2.9% with streptococcus bovis, streptococcus pneumoniae. MRSA and Enterococcus gallinarum was foundin 1.4% of the patients.

In study by Patil et al., showed the presence of gram positive cocci in 17.46% of patients and presence of gram negative bacilli in 70.27% in patients with VAP. The organisms isolated were predominantly GNB Klebsiella 29(23.01587%), Pseudomonas 27(21.42%), Acinetobacter 24(19.04%), and E. Coli 19(15.07%) with high mortality rates.[34] In study by Ahsan ASM et al., documented Gram-negative organisms (76.13 percent) were the most often isolated species, followed by fungus (17.04 percent) and gram-positive cocci (6.81 percent). [38]

In our study tigecycline was found to be the most sensitive antibiotic, followed by gentamycin, with more than a two third of the sample size showing a high degree of sensitivity to these two antibiotics. Majority of the other drugs were in range of 10% to 20%sensitivity, were Amikacin, Amoxiclav, Cefoxitin, Ceftazidime Ciprofloxacin Levofloxacin, Meropenem, Colistin Trimethoprim ,Fosfomycin ,Teicoplanin, Oxacillin, Penicillin, Ampicillin, Aztreonam, Cefepime, Cefotaxim,

Cefazolin, Norfloxaxin, Ertapenem, Rifampicin, and Daptomycin were all found to be resistant to a wide range of medicines.

In study done by Patil et al.,16(12.69 percent) isolates were sensitive to meropenem, 19(15.07 percent) to piperacillin (PI), 20(15.87 percent) amikacin, 27(21.42 percent) tigecycline and 18(14.28 percent).Several gram negative isolates have been found to be more sensitive to Colistin, Amikacin, and Meropenem than other antibiotics.[34]

In study by Ahsan ASm et al., Acinetobacter sp. was the most frequent pathogen, Klebsiella sp., Candida sp., and Pseudomonas sp. were next. Among the gram negative organisms, Acinetobacter sp., Klebsiella sp., and Pseudomonas sp. were particularly resistant (>80%) to third generation cephalosporins and fluoroquinolones. Resistance to aminoglycosides (>68%) and imipenem (>60%) was also common. When compared to Acinetobacter sp. and Klebsiella sp., Pseudomonas sp. resistance to piperacillin-tazobactum was lower (18.2 percent). Many intensive care units are concerned about the development of therapeutic resistance against the bacteria that causes VAP, according to these findings. Antibiotic susceptibility patterns can assist you in avoiding unnecessary antibiotic use and in the effective management of VAP. [38]

Gram-negative bacilli were shown to prevail in a study by Chaudhury et al., followed by Pseudomonas spp. and Klebsiella spp. Klebsiella spp. (23.7 percent in 2011 to 19.3 percent in 2013) and E. coli decreased slightly in relative frequency over time, although the overall number of these organisms remained stable (14.9-11.5 percent throughout the same period).[35]

CONCLUSION

Prevalence of multidrug-resistant microorganisms is at increasing rate. Among them, gram negative organism are predominant than the gram positive organisms.

The common clinical presenting feature was found to be fever followed with tachycardia and increased tracheal secretions secretions.

The common isolate among the various samples from different critical ward was found to be positive for Klebsiella Pneumoniae followed with presence of Enterobacter cloacae.

The sensitivity pattern showed, highest sensitivity to Tigecycline followed by gentamycin among the organism and more than 90 percent resistance was documented with the oxacillin, penicillin, ampicillin, aztreonam, cefepime, cefotaxim, cefazolin, Cefuroxime, norfloxaxin, ertapenem, rifampicin and daptomycin.

VAP prolongs the hospital stay of the patients thus increases the cost of treatment and worsens the outcome.The understanding of sensitivity and resistance pattern of organisms causing VAP can help in developing an efficient antimicrobial policy against these infections.

SUMMARY

- Present study was undertaken on 70 patients suffering from ventilator associate pneumonia in KLE's Prabhakar Kore Hospital and Medical research centre during the period of January 2020 to December 2020.
- In the present study of 70 patients with VAP, their clinical features, and sensitivity and resistance pattern of endotracheal aspirate of pateints was collected noted.
- Mean age of patients was found to be 49.3 with majority of the patients belonging to age group of 40-60 years. Male prepondarence was seen with male to female ratio of 6:1.Most patients did not have any comorbid condition but most common was hypertension followed by diabetes mellitus.
- Among the clinical features most patients had fever (64.4.2%) followed by tachycardia (60%) and increased tracheal secretions (55.7%).
- Out of 70 patients included in the study 10 pateints expired(14.3) and rest improved.
- The most common bacteria causing VAP among the various samples from different ICU's were Klebsiella Pneumoniae followed by presence of Enterobacter cloacae.
- The sensitivity pattern showed, Tigecycline has highest sensitivity followed by Gentamycin among the organism and more than 90 percent resistance was documented with the oxacillin, penicillin, ampicillin, aztreonam, cefepime, cefotaxim, cefazolin, Cefuroxime, norfloxaxin, ertapenem, rifampicin and daptomycin.
- VAP prolongs the hospital stay of the patients thus increases the cost of treatment and also worsens the outcome.

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ANNEXURE I. ETHICAL CLEARANCE.

K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed - to-be- University)
Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (GoI)
JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)
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Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref: MDC/DOME/ 276. **Date: 24/12/2019**

To,

REG NO: BG0119013

J.N.Medical College,
BELAGAVI.

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"CLINICAL PROFILE AND PATTERNS OF ANTIMICROBIAL RESISTANCE IN VENTILATOR ASSOCIATED PNEUMONIA PATIENTS –A CROSS SECTIONAL STUDY"**, is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Anita Dalal)
Member Secretary
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

(Dr. Roopa M Bellad)
Chairman,
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

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ANNEXURE II

INFORMED CONSENT

Title: ''Clinical profile and Patterns of antimicrobial resistance in ventilator associated pneumonia patients admitted in INTENSIVE CARE UNIT'', BELAGAVI.

A ONE YEAR CROSS SECTIONAL STUDY

Study investigator: _____

P.G- M.D.GENERAL MEDICINE.

J.N. Medical College,

KLE University,

Belagavi-590010.

INTRODUCTION: You are being invited to participate in this study of **"CLINICAL PROFILE OF PATIENTS WITH VENTILATOR ASSOCIATED PNEUMONIA ADMITTED IN INTENSIVE CARE UNIT, BELAGAVI. AND THEIR SENSITIVITY AND RESISTANCE PATTERN IN A ONE YEAR CROSS SECTIONAL STUDY"**

EXPLANATION OF PROCEDURE: All patients developing ventilator associated pneumonia the study subjects

Demographics:Name :

Age/sex :

Address :

Contact No:

History:

Clinical features:

Complete respiratory system examination

Routine blood investigations are sent by collecting blood sample which will include

CBC

RADIOLOGICAL INVESTIGATION will include

Chest X ray AP view

MICROBIOLOGICAL INVESTIGATION INCLUDES

Endotracheal Aspirations collected from ET tube and sent for culture and sensitivity of the study subjects collected and standard of care continued and risk factors are assesed

POSSIBLE BENEFITS: The investigator does not promise or guarantee that you will receive any benefit being in the study; however, it will be aimed at better understanding of the risk factors and clinical profile of patients with ventilator acquired pneumonia admitted in ICU which might be beneficial for proving support for future management in ICU clinical practice

CONFIDENTIALITY: All information collected during the course of study will be kept confidential.

WITHDRAWAL: Participation in this study is voluntary. If you don't wish to participate in this study; you will not lose benefits to which you are entitled. After starting the study, anytime during the study, if you feel to withdraw from the study, you are free to do so.

COST OF PARTICIPATION: The cost of the study will be borne by the researcher. There will be no additional cost to you for participation in the study.

AUTHORIZATION TO PUBLISH THE RESULTS: The results of the study would be forwarded to the KLE University, Belgaum as part of requirement towards the completion of MD degree, review and publishing.

In case of the queries during study or in future you may contact following persons,

REG NO: BG0119013
Department Of General Medicine
Jawaharlal Nehru Medical College,
Belagavi - 590010
Phone number-7769966589

_____,
Associate Professor,
Department Of Medicine,
Jawaharlal Nehru Medical College,
Belagavi – 590010
Phone No.9844595659

Consent Statement.

I voluntarily agree to take part in this study by signing below. I may withdraw at any time. I am not giving up any of my legal rights by signing this form. My signature below indicates that I have read, or it has been read to me, this entire consent form, and have had all my questions answered.

Signature / Left Thumb print of the Participant or legally authorized representative

Participant's name :……...

Signature / Left thumb impression:… ...……...

of the participant

Name of the legally authorized

(representative or guardian) …….....

Signature / Left thumb impression :……...

Witness' name :……...

Signature / Left thumb impression :……...

Investigator's name and signature ……...

Date:

Place:

ANNEXURE III

PROFORMA

Patients details

Name : **IP/OP number** :

Age/ Sex : **Address** :

Contact No. :

CLINICAL FEATURES :

H/o comorbidities:

General Physical Examination:

Pulse: / min ; **RR:** cycles /min

BP: / mm Hg**;** **Temperature:** ^{0}**F**

SYSTEMIC EXAMINATION:

RS:

1) PERCUSSION

2) AUSCULATATION

INVESTIGATIONS:

CBC

Chest X ray – AP View

Endotracheal Tube Aspirations Culture sensitivity

ORGANISM ISOLATED	ANTIBIOTIC SENSITIVITY	ANTIBIOTIC RESISTANT

Duration of hospital stay :