Volume 4, Issue 3, 2026

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

# FREQUENCY OF VENTILATOR ASSOCIATED PNEUMONIA AT REHMAN MEDICAL INSTITUTE PESHAWAR

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DOI: http://doi.org/10.5281/zenodo.19062215

**Keywords**
*mechanical ventilator, pneumonia*

**Article History**
*Received: 17 January 2026*
*Accepted: 01 March 2026*
*Published: 17 March 2026*

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## Abstract

***Background***

*In this study most of the patient observed under the mechanical ventilation which suffer from shortness of breath chronic kidney disease and unconsciousness due to effective prevention and infection control protocol like regular suctioning no one patient diagnosed with ventilator associated pneumonia these all-patient age between 1-65 year plus all these patients admitted in Rehman medical institute*

***Objective of the study***

*To establish the frequency of ventilator -associated pneumonia (VAP) in a patient receiving mechanical ventilation.*

***Methodology:***

*This descriptive cross-sectional study was carried out at Rehman medical institute Peshawar. Prior to gathering data, ethical approval was acquired. This involves examining patient reports of mechanical ventilation to determine underlying causes. All data was analyzed using SPSS program V20. For the research variables, descriptive statistics were computed.*

***Results***

*This study analyzed demographic, clinical, and procedural characteristics of 206 patients requiring mechanical ventilation. Key findings include a majority male population (59.7%), with adults aged 40–64 being most common. The primary reasons for ventilation were chronic kidney disease, unconsciousness, and shortness of breath, accounting for 75.7% of cases. Most patients (88.3%) needed ventilation for five days or less. No cases of ventilator associated pneumonia were observed, suggesting effective infection control. Endotracheal tubes were the preferred ventilation method, and bacterial infections were prevalent. Common comorbidities included diabetes, hypertension, and heart disease. This study underscores the importance of managing chronic conditions, preventing infections, and ensuring regular airway clearance for better patient outcomes.*

***Conclusion***

*This study highlights that most mechanical ventilated patient is middle aged male and female with chronic kidney disease unconsciousness and shortness of breath*

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ISSN: (e) 3007-1607 (p) 3007-1593

*as primary cause no case of ventilator associated pneumonia is observed in this study. This study underscores the importance of managing chronic condition preventing infection and ensuring regular airway clearance for better patient outcome.*

## INTRODUCTION

Pneumonia is the inflammation of the lung's air sacs, typically caused by an infection or other injury. When the airways are affected, it is often referred to as bronchopneumonia. Pneumonia can involve just one part of the lung or multiple areas, known as "double" or "multi-lobar" pneumonia. While it can have various causes, infections are the most common source(1). Pneumonia primarily affects the alveolar spaces in the lower respiratory tract, all the bronchioles and small bronchi. It occurs when microorganisms grow in these areas and trigger an immune response. However, an increase in microorganisms cannot always cause pneumonia. For example, patients who are a long-term mechanical ventilation may be high microbial cause indicative of pneumonia but show no symptoms. This condition, where microorganisms are present without a proper immune response, is called colonization. Pneumonia is specifically distinguished from other respiratory infections by its involvement of the alveoli. Infections in the conducting airways below the vocal cords are classified as tracheitis, bronchitis, or bronchiolitis, depending on the specific area affected. These conditions are often collectively referred to as lower respiratory tract infections (LRTIs), which are distinct from upper respiratory infections (URIs). URIs, such as laryngitis, pharyngitis, and rhinitis, are more prevalent, generally viral, and tend to be less severe (2).

### 1.Epidemiology

Before 1945, *Streptococcus pneumoniae* was responsible for the most of 90% of adult pneumonia samples. However, after 1950, its prevalence began to decrease significantly. Today, pneumococcus is identified in fewer than 15%-10% of samples, although this rate It is higher in Europe, likely because of variations in vaccination practices and smoking habits. Other pathogens, including gram-negative bacilli, *Staphylococcus aureus*, *Chlamydia*, *Mycoplasma*, and *Legionella*, are found in5% - 2% of pneumonia cases that need hospitalization. Viruses contribute to about 25% of pneumonia cases, with bacterial coinfections occurring in as much one-third of these instances. Importantly, recent studies reveal that more than 50% of pneumonia cases do not have a clearly identified causative organism, which presents a significant challenge in Comprehending lower respiratory infections. These findings are crucial for antibiotic stewardship and should guide the development of new policies for empiric pneumonia treatment (3). Acute respiratory infections (ARI) are the leading cause of death among children aged five, responsible for nearly two million expiries annually. Many expiries (>95%) causes in developing nations, with pneumonia being the primary cause. Pneumonia alone is responsible for about 20% of all expiries in children under 5 globally each year, making it the leading cause of expiries from a random disease. Severe infections contribute to 50-30% of neonatal mortality in different regions and distinguish between expiries caused by pneumonia and those resulting from sepsis cases. Including neonatal pneumonia, pneumonia remains the leading cause of child deaths, responsible for approximately 28–34% of all deaths in children under five globally. The estimated incidence of clinical pneumonia in children under five is 0.28 episodes per child per year in developing countries, compared to 0.05 episodes per child per year in developed countries. In India, the rate is even higher, at approximately 0.37 episodes per child per year. Each year, nearly 155 million cases of clinical pneumonia occur in children under five, with 11–20 million (7–13%) of these cases being severe enough to require hospitalization. It is important to note that, unlike the significant reduction in mortality from diarrheal diseases, the overall burden of pneumonia-related deaths has shown minimal improvement, despite the launch

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ISSN: (e) 3007-1607 (p) 3007-1593

of a global program to control Acute Respiratory Infections (ARI) nearly 15 years ago (4).

A retrospective study applied ventilator-associated event (VAE) definitions to data from a time-series analysis of ventilator-associated pneumonia (VAP) clinical practices in 11 North American ICUs. Among 1,320 patients, A total of 139 patients (10.5%) developed a ventilator-associated condition (VAC), 65 patients (4.9%) developed an infection-related VAC (IVAC), and 148 patients (11.2%) developed ventilator-associated pneumonia (VAP). The agreement between VAP and VAC was poor (k = 0.18), as was the agreement between VAP and IVAC (k = 0.19). Improved adherence to VAP prevention guidelines led to a reduction in both VAP and VAC rates, but did not affect IVAC rates. Another study also reported poor agreement (k = 0.16) and identified VAP as the primary cause of VACs, most of which were considered nonpreventable (5). This study enrolled 621 patients with ventilator-associated pneumonia (VAP), with 98.4% Of the cases, the majority were first episodes. Epidemiological details are presented in Tables 1 and 2. The cohort included 333 males (53.6%) and 288 females (46.4%), with a mean age of 62.2 ± 18.1 years (ranging from 15 to 99 years). Late-onset ventilator-associated pneumonia (VAP) was observed in 85.3% of the patients. The median duration of hospitalization and mechanical ventilation before the onset of VAP was 9 to 10 days, respectively.

Clinical Pulmonary Infection Score (CPIS) was 8.1 ± 1.3, while the mean Simplified Acute Physiology Score II (SAPS II) and Sequential Organ Failure Assessment (SOFA) scores were 46.3 ± 14.2 and 6.6 ± 2.7, respectively. The mortality rates at 30 days, in the ICU, and during hospitalization were 44.4%, 29.0%, and 50.9%, respectively.

Acinetobacter baumannii was the most prevalent pathogen responsible for VAP (54.3%), followed by Pseudomonas aeruginosa (35.2%) and methicillin-resistant Staphylococcus aureus (MRSA) (15.1%). Among the A. baumannii isolates, 9.8% were drug-sensitive,

21.4% were multidrug-resistant (MDR), 65.3% were extensively drug-resistant (XDR), and 3.6% were pan-drug-resistant (PDR). Despite 363 patients (59.3%) receiving early and appropriate antibiotic treatment, a significant proportion (31.5%) received early but inappropriate treatment (see Tables 2 and 3). The most used initial antibiotics were colistin (33.2%) and carbapenems (27.0%), with the average duration of antibiotic therapy being 12.62 ± 5.7 days.

The predominant pathogen in this study was XDR *A. baumannii*, and late-onset VAP accounted for most cases (85.3%), which is consistent with findings from other studies in In Asian countries, Acinetobacter species were the most commonly isolated pathogens (36.5%), followed by Pseudomonas aeruginosa (25.9%) and Klebsiella pneumoniae (16.8%). A high prevalence of extensively drug-resistant (XDR) Acinetobacter has been reported in Asia, with rates reaching up to 51.1%. Our center reported a 65.3% incidence of XDR Acinetobacter, which is higher than in other Asian countries, possibly due to our hospital serving as a training and referral center for hospitals throughout northern Thailand.

Additionally, there was a notable difference in the distribution of gram-negative versus gram-positive bacteria compared to Western reports. Specifically, we observed a much lower proportion of gram-positive organisms, particularly MRSA, as causative agents at our institution. The high incidence of drug-resistant organisms in our ICU may be partly attributed to the absence of routine antibiotic prophylaxis protocols for gram-negative organisms. This growing prevalence of drug-resistant pathogens has had a significant impact on VAP outcomes. Factors such Drug-resistant pathogens, severe pneumonia, and multiple organ failure are closely linked to high mortality rates. In our study, the overall mortality rates at 30 days, in the ICU, and during hospitalization were 44.4%, 29.0%, and 51%, respectively, which align with the results of other studies.

Mortality rates as high as 70% have been observed in specific settings, especially in cases caused by drug-resistant pathogens.

In Asian countries, the crude 30-day VAP mortality The reported 30-day mortality rate ranges from 11.1% to 66.7%, with an average of 44.8%. Our 30-day mortality rate was slightly higher than the 30% reported by Kollef et al.,

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ISSN: (e) 3007-1607 (p) 3007-1593

likely due to the greater severity of illness in our patient population, as reflected in the high SAPS II (46.3 ± 14.2) and SOFA (6.6 ± 2.7) scores. Additionally, nearly half of our patients had septic shock, which is a strong predictor of mortality (6).

**2.Types of pneumonia**

Community-acquired pneumonia continues to be a major cause of illness and death, and it is frequently misdiagnosed or inadequately treated. While it can be caused by a variety of microorganisms, the most common pathogens include Streptococcus pneumoniae, atypical pathogens like Mycoplasma pneumoniae and Chlamydophila pneumoniae, Staphylococcus aureus, and certain Gram-negative rods. Determining the appropriate site of care is crucial, as it affects the type and extent of diagnostic testing and treatment. Antimicrobial therapy should be initiated promptly, particularly for patients requiring hospitalization, though physicians frequently face uncertainty regarding the exact causative pathogen (7).

Hospital-acquired pneumonia (HAP) is the most prevalent infection in intensive care units (ICUs) and consists of two primary types: ventilator-associated pneumonia (VAP), which is linked to mechanical ventilation, and severe pneumonia that develops during a patient's hospitalization. Nosocomial pneumonia is the most common infection in ICU settings, especially when considering the timing of its onset. Non-ventilator HAP occurs in patients who have been hospitalized for at least 48 hours, whereas VAP is defined as pneumonia that develops more than 48 hours after the initiation of mechanical ventilation. (8).

Pneumonia has been the subject of significant misunderstanding. It is important to recognize that aspiration-related pneumonia can be classified into four primary clinical categories. The first category involves airway obstruction caused by the aspiration of particulate matter, foreign objects, or large amounts of inert fluids. The second category is chemical pneumonitis, typically resulting from the aspiration of gastric contents, but it can also occur from inhaling chemicals, smoke, or lipoid substances. The third category refers to drowning. The fourth category, which this review focuses on, is pneumonia caused by infectious agents, which may arise from the aspiration of particulate matter, chemical pneumonitis, or the inhalation of oropharyngeal secretions containing bacteria. Special precautions are necessary to preserve normal and colonizing flora while maintaining the viability of anaerobes. In addition to draining empyema, the primary treatment for aspiration pneumonia involves the use of antimicrobial medications. Treatment options vary, and the most appropriate choice depends on the specific infecting pathogens and the severity of the patient's condition (9). Pneumocystis jirovecii is an atypical opportunistic fungus that can lead to life-threatening

Pneumocystis pneumonia (PCP) in individuals with weakened immune systems. Prior to the HIV/AIDS epidemic, PCP mainly affected premature or malnourished infants, as well as individuals with cellular immunodeficiencies due to conditions such as hematological cancers, T cell deficiencies, or severe illnesses requiring corticosteroid treatment. In comparison to PCP in HIV-infected patients, PCP in non-HIV immunosuppressed individuals typically has a shorter incubation period, a higher risk of respiratory complications and death, and a more rapid progression of the disease. which makes early diagnosis more difficult. Given the significant risks associated with PCP in immunodeficient patients, it is crucial for clinicians and healthcare professionals to stay updated on the evolving epidemiology of PCP and to identify high-risk patients early to start appropriate prophylaxis or treatment without delay (10).

**3. Causing of pneumonia**

Pneumonia can be triggered by various microorganisms, including bacteria, respiratory viruses, and fungi, with the prevalence of each differing by region. It is more prevalent among vulnerable populations, especially the elderly with chronic health conditions and children under five. Pneumonia is generally classified into two types: hospital-acquired pneumonia (HAP), which includes ventilator-associated pneumonia (VAP), and community acquired pneumonia (CAP). In

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ISSN: (e) 3007-1607 (p) 3007-1593

CAP, the most frequent pathogens are *Streptococcus pneumoniae*, *Hemophilus influenzae*, as well as other bacteria like *Mycoplasma pneumoniae* and *Legionella pneumophila*. On the other hand, HAP is typically caused by microorganisms such as Enterobacterales, non-fermenting gram-negative bacilli, and *Staphylococcus aureus*, including both methicillin-sensitive and methicillin-resistant strains (11). *Streptococcus pneumoniae*, often referred to as pneumococcus, has long been dubbed "the captain of all the men of death," a label that still holds true today. Severe community-acquired pneumonia is the leading cause of infection-related deaths in developed nations, with pneumococcus being the most common cause of lower respiratory tract infections. Although other respiratory pathogens like influenza, pertussis, tuberculosis, and *Hemophilus influenzae* can generally be treated effectively, pneumococcus continues to be the primary cause of community-acquired pneumonia worldwide (12).

**4. Sign and symptoms:**

Pneumonia commonly presents with respiratory symptoms such as cough, shortness of breath, sputum production, and chest pain, along with systemic signs like fever, chills, body aches, and general discomfort (13). A productive cough is the most frequent early sign of bacterial pneumonia. The color of the sputum can offer clues to the causative pathogen; for instance, rust-colored sputum may indicate *Streptococcus pneumoniae*, green sputum suggests *Pseudomonas aeruginosa*, redcurrant-jelly sputum is linked to *Klebsiella* species, and foul-smelling or unpleasant-tasting sputum often points to anaerobic bacteria. Bacterial pneumonia typically presents with a rapid onset of symptoms and a swift progression of illness. In contrast, viral pneumonia generally starts gradually with upper respiratory symptoms and wheezing and is more commonly seen in children. Lung involvement can lead to chest pain, difficulty breathing, hemoptysis, reduced exercise tolerance, and abdominal pain from pleuritis. Common symptoms of pneumonia also include fever, chills or shaking, and general malaise. Interestingly, the presence of chills is often associated with pneumococcal pneumonia, although the reason for this link is not well understood. Other non-specific symptoms may include muscle aches, headaches, abdominal discomfort, nausea, vomiting, diarrhea, weight loss, and changes in mental status. In very young children and elderly individuals, symptoms may be less specific (14). The many signs to see like temperature, tachypnea or dyspnea, rhonchi, crackles, and wheezing (15).

**5. Diagnosis of Pneumonia:**

The National Institute for Health and Care Excellence (NICE) guidelines advise obtaining a chest image soon after admission to secondary care to determined consolidation and assess for potential complications like pleural effusions. Furthermore, basic inspection should involve blood tests, such as a complete blood count and adrenal function tests. Arterial blood gases should be assessed in patients showing signs of hypoxemia or hypotension (16). The diagnosis of pneumonia typically involves the diagnosis of pneumonia typically involves a combination of clinical history, physical examination, and laboratory tests. According to most clinical guidelines worldwide, (CXR) is considered the gold standard for investigation pneumonia, as it effectively differentiates pneumonia from other respiratory conditions. Other diagnostic tools, such as laboratory tests (including white blood cell count (WBC), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), and procalcitonin), along with blood cultures, serology, and computed tomography (CT) scans, are also utilized, but their accuracy can vary. However, in primary care settings, access to CXR and other diagnostic resources like sputum and blood cultures may be limited due to economic and logistical challenges. While CT scans are seen as a superior diagnostic tool, they are often not available to primary care patients. Consequently, primary care physicians usually depend on the patient's medical history and physical inspection to investigate or rule out pneumonia. Furthermore, performing a CXR for every patient suspected of having pneumonia is not always practical in community settings. This highlights the need for decision aids to help guide the appropriate use of CXR in diagnosing

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ISSN: (e) 3007-1607 (p) 3007-1593

pneumonia, especially in these settings, to more effectively assess patient risk. Several prediction rules have been developed to enhance the determine of pneumonia in progenesis environments (17).

**6. Treatment of Pneumonia**

When determining empirical treatment, it is essential to consider the patterns of antimicrobial susceptibility and the local distribution of pathogens. For early occurrence VAP not multi drug resistant (MDR) risk determinant, the recommended antibiotics typically include Ceftriaxone, a fluoroquinolone, ampicillin-sulbactam, or ertapenem (15). A large number of patients who require mechanical ventilation during a noninfectious hospitalization are at risk for ventilator-associated pneumonia (VAP), a major type of healthcare-associated infection commonly observed in intensive care units (ICUs)(18). majority sampling of pneumonia can be managed on an OPD basis. To determine the appropriate treatment setting, several severity assessment tools have been developed. The Pneumonia Severity Index (PSI) assesses 20 variables to categorize patients into one of five risk groups (I-V) based on their 30-day mortality risk. It primarily focuses on the likelihood of death within 30 days, using five key factors (confusion, urea level, respiratory rate, blood pressure, and age over 65), with each factor assigned a point, making the tool easy to apply. The CRB65, which omits the need for blood urea measurement, is especially useful in outpatient settings. Whenever possible, treatment for community-acquired pneumonia (CAP) should be based on local resistance patterns. For previously healthy individuals suitable for outpatient care, the first-line treatment is a macrolide antibiotic such as azithromycin, which targets *S. pneumoniae*, many of common causative pathogen. Doxycycline is an alternative option. Patients with underlying health conditions, such as diabetes, chronic heart, lung, renal, or liver disease, alcoholism, asplenia, immunocompromised states, or recent antibiotic use within the past three months, are at greater risk for drug-resistant *S. pneumoniae*. For these patients, a respiratory fluoroquinolone or a beta-lactam combined with a macrolide is recommended. Empirical antibiotic therapy remains a fundamental component of treatment, and knowledge of local microbial resistance patterns can enhance the effectiveness of outpatient pneumonia management, regardless of demographic factors or comorbidities. Special considerations, including persistent pneumonia, management of pediatric or geriatric populations, travel related infections, and other unique situations, require careful attention to the patient's history, physical examination, and appropriate antibiotic selection (15).

**7. Ventilator associated pneumonia**

Ventilator-associated pneumonia (VAP) is a type of nosocomial infection that develops at least 48 hours after the start of mechanical ventilation. It can be caused by factors such as contaminated ventilator tubing condensate, reduced gastrointestinal function due to antibiotic use, stress ulcer prophylaxis, supine positioning of the head, parenteral nutrition, nasogastric intubation, and poor hand hygiene (19). The onset of VAP is mainly driven by the complex interactions between the endotracheal tube, various risk factors, the aggressiveness of invasive bacteria, and the body's immune response(20).

Pneumonia rates in intubated patients are six to twenty-one times higher, with the risk increasing as mechanical ventilation is prolonged. The incidence of VAP varies based on the population, ranging from 6 to 52 cases per 100 patients. Typically, VAP occurs in 3% to 1% of intubations involving mechanical ventilation. The most accurate measure is the incidence per 1,000 ventilator days, with reported rates ranging from 5 cases per 1,000 days in pediatric patients to 35 cases per 1,000 days in patients with burn injuries, according to the National Nosocomial Infections Study. In general, ICU patient rates range from 10 to 15 cases per 1,000 ventilator days, with higher rates seen in surgical ICU patients (21). Intubation with an artificial airway increases the risk of developing pneumonia by a factor of 21. Ventilator associated pneumonia (VAP) accounts for 80% of hospital-acquired pneumonia cases, typically affecting patients who are intubated or

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have undergone tracheostomy while on mechanical ventilation. VAP is the most common nosocomial infection in intensive care units (ICUs), responsible for more than half of antibiotic prescriptions in these settings. While patients with VAP have a high mortality rate, it remains uncertain whether they would survive without this complication. This article reviews VAP in adult patients, focusing on recent research into the causative organisms based on identifiable risk factors. Studies suggest that categorizing patients by the duration of mechanical ventilation and prior antibiotic exposure can help predict the likely pathogens. However, a retrospective multicenter study comparing four treatment centers found significant variation in the causes of VAP across institutions. These differences were associated with factors such as patient demographics, prophylactic strategies, diagnostic methods, and, notably, local resistance patterns (22).

**8. Pathophysiology of ventilator associated pneumonia:**

Many of the mechanisms have been proposed to explain infections of the pulmonary parenchyma, but a deeper understanding is needed to prevent infectious pulmonary complications in critically ill patients on mechanical ventilation. The development of hospital-acquired pneumonia (HAP) or ventilator-associated pneumonia (VAP) is influenced not only by the number and virulence of microorganisms entering the lower respiratory tract but also by the patient's defense mechanisms, involve cellular, humoral, and mechanical responses. The presence of an endotracheal tube increases the risk of micro-aspiration, which can result from normal oropharyngeal flora or even material from the gastrointestinal tract. Another common mechanism in mechanically ventilated patients involves exogenous contamination from environmental sources, such as humidification systems or various respiratory devices. multifil changes to ventilator circuits are normally not recommended to prevent infection, as the maximum safe time for using the same circuit is not well established. Exogenous contamination can also occur during procedures like tracheal suctioning, fiberoptic bronchoscopy, or disconnecting the ventilator circuit during patient transport. The pathogenesis of VAP is pattern by a complex interaction of factors, including compromised host immunity, which can result from impaired molecular pattern allow, altered phagocytosis, T-cell inhibition, and monocyte deactivation. Moreover, the presence of the endotracheal tube contributes to biofilm emerge and impaired mucociliary clearance (23).

**9. Causes of ventilator associated pneumonia**

The primary risk factor for ventilator-associated pneumonia (VAP) is the presence of an endotracheal tube, which disrupts normal airway defenses, impairs effective coughing, and promotes micro-aspiration of contaminated pharyngeal contents. This risk is much lower in patients using non-invasive ventilation with a tight-fitting facemask, highlighting the key role of the endotracheal tube in pneumonia development. Reintubation after failed extubating further increases the risk of pneumonia. Most cases of VAP arise from the micro-aspiration of contaminated oropharyngeal secretions. Illness, antibiotic use, or hospitalization often led to rapid colonization of the oropharynx by aerobic Gram-negative bacteria, which weaken host defenses and enhance bacterial adherence to mucosal surfaces. These contaminated secretions can accumulate above the cuff of the trachea or tracheostomy tube and gradually enter the airway through folds in the cuff wall. A bacterial biofilm, resistant to systemic antibiotics, forms on the inner surface of the endotracheal tube and acts as a reservoir for infection. Ventilator cycling can propel pathogen-laden biofilm and secretions into the distal airways. While the size of the biofilm and bacterial virulence contribute to infection risk, the host's immune response plays a crucial role in determining whether parenchymal infection and VAP will develop. Critically ill patients often experience immunosuppression, which increases their susceptibility to nosocomial infections. Neutrophils, essential for fighting bacterial infections, often show dysfunction and impaired phagocytosis in mechanically ventilated patients.

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Research by Morris and colleagues found that patients with suspected VAP had significantly reduced phagocytic activity, linked to the overexpression of the inflammatory anaphylatoxin C5a. Elevated C5a levels impair neutrophil function, and further studies suggest that this C5a-driven immunosuppression occurs before the onset of nosocomial infections, rather than as a coincidental finding (24). Patients with acute respiratory distress syndrome (ARDS) caused by SARS-CoV-2 who require invasive mechanical ventilation are at a particularly high risk (over 50%) of experiencing at least one episode of ventilator-associated pneumonia (VAP) during their illness. The bacteria responsible for VAP vary by region and include both Gram-positive and Gram-negative pathogens. Factors such as the severity of the disease, treatment strategies, diagnostic challenges, and logistical issues related to the pandemic have all contributed to the high incidence of VAP in COVID-19-associated ARDS (C-ARDS) patients. Despite recent advancements, the current diagnostic criteria and treatment approaches for VAP remain largely based on practices established before the SARS-CoV-2 pandemic (25).

**10. Pathogenesis of ventilator associated pneumonia:**

The most common pathogens responsible for ventilator-associated pneumonia (VAP) include aerobic Gram-negative bacilli such as *Pseudomonas aeruginosa*, *Escherichia coli*, *Klebsiella pneumoniae*, *Stenotrophomonas melophilia*, and *Acinetobacter* species, along with Gram-positive organisms like *Staphylococcus aureus*. VAP is classified into early-onset and late onset infections, with late-onset defined as occurring after five days of intubation. Late-onset infections are more likely to involve multidrug-resistant (MDR) Gram-negative bacteria and methicillin-resistant *Staphylococcus aureus* (MRSA). In immunocompetent patients, anaerobic organisms, fungi, and viruses are rarely responsible for VAP. Following ICU or hospital admission, the oropharynx and upper gastrointestinal tract often become colonized with pathogens endemic to the facility. Aspiration of these colonized secretions is the primary method by which pathogens enter the respiratory tract. Endotracheal intubation impairs host defenses, such as effective coughing and mucociliary clearance, making it easier for pathogens to reach the lower airways. Additionally, nasal instrumentation increases the risk of sinusitis, which is linked to a higher likelihood of VAP, while gastrointestinal instrumentation can compromise gastroesophageal sphincter function, increasing the risk of aspiration. Once pathogens reach the lower respiratory tract, they can colonize the airways, and if the host's defenses are overwhelmed, infection and VAP can develop. Biochemical markers like C-reactive protein (CRP) and procalcitonin (PCT) are increasingly used in ICU settings, including for diagnosing VAP. Both markers are elevated in systemic inflammatory response syndrome (SIRS), with PCT being particularly useful in predicting bacterial infections that cause SIRS. However, their role in diagnosing VAP remains unclear. CRP levels are often elevated in both suspected and confirmed VAP cases, while PCT levels are more significantly elevated in confirmed VAP cases (26). The chances of ventilator associated pneumonia (VAP) duration-dependent, with higher mortality rates seen in cases caused by Pseudomonas aeruginosa and Acinetobacter species. This time dependency can introduce bias, as mortality and ICU discharge act as competing endpoints. Hospital-acquired pneumonia (HAP) and VAP can be caused by a variety of microorganisms, necessitating different diagnostic and therapeutic approaches. Guidelines for managing HAP and VAP are primarily intended for specialists in respiratory medicine and critical care but are also relevant to general internists, infectious disease specialists, pharmacists, microbiologists, and policymakers. Early-onset HAP and VAP, which occur within the first four days of hospitalization, generally have a better prognosis and are more likely to involve antibiotic sensitive bacteria. In contrast, late-onset HAP and VAP (≥5 days) are many commonly associated with multidrug-resistant (MDR) pathogens, leading to increased morbidity and mortality (27).

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**11. Diagnosis of ventilator associated pneumonia**

Clinical criteria stay crucial for investigation (VAP), but the specific criteria utilized can vary widely, influencing reported incidence and progenesis. Traditionally, the investigation of VAP is based on two or three main components: (1) systemic signs of infection, (2) new or worsening infiltrates observed on chest imaging, and (3) microbiological evidence of pulmonary parenchymal infection, when available. However, clinical symptoms such as temperature (42%), purulent airway secretions (67%), and chest radiographs often have high false-positive rates. moreover, together these criteria do not significantly enhance diagnostic accuracy, and relying solely on histopathology and microbiology has its own notable limitations (28).

The early occurrence in diagnosing VAP is clinical inspection. Many used clinical definition of suspected pneumonia includes a pulmonary infiltration on a CXR along with 2 of the following 3 criteria: leukocytosis or leukopenia, purulent respiratory secretions, and temperature or chill fever. While this approach is sensitive, its specificity is limited. The next step in diagnosis involves obtaining lower respiratory tract samples for microbiological testing. It is essential to consider whether new antibiotics were introduced in the past 72 hours, as this can impact the effectiveness of these tests. In critical care settings, blind techniques for sampling the lower respiratory tract have become widely accepted. Additionally, it is important to recognize that VAP is often a multifocal disease, with evidence suggesting it can affect both lungs simultaneously (29).

**12. Treatment of ventilator associated pneumonia**

The IDSA/ATS and ERS direction emphasize the importance of initiating proper antibiotic treatment, as incorrect treatment is linked to poorer patient outcomes. However, indiscriminate antibiotic use carries significant risks, such as rise resistance rates, Clostridium difficile colitis, further adverse outcome. These directions strive to balance the risks of under- and overtreatment, though there is limited data quantifying the associated morbidity and mortality. The IDSA/ATS guidelines aim to ensure that 95% of patients receive appropriate initial empiric therapy, recognizing that pushing for 100% coverage may lead to diminishing returns and excessive antibiotic use. Resistance rates vary greatly across ICUs, and patient-specific determinant for multidrug-resistant (MDR) pathogens are not fully recognized, making complication create universal antibiotic regimens. Studies show that the first cause VAP occurring during four five days of hospitalization, is less likely to involve MDR organisms like MRSA or Pseudomonas aeruginosa compared to late-onset VAP. Consequently, the 2005 IDSA/ATS guidelines suggested that empiric treatment for initial occurrence VAP without MDR risk factors does not need to cover these pathogens. The ERS guidelines also offer recommendations for VAP but highlight the presence of substantial MDR rates in this group, often related to other risk factors beyond the duration of hospital stay. This underscores the importance of identifying subgroups of initial occurrence VAP patients who are at low enough risk for MDR pathogens to safely use narrow-spectrum antibiotics. Both the IDSA/ATS and ERS guidelines propose early empiric antibiotic regimens, though their approaches differ. The ERS guidelines assess whether monotherapy is sufficient or if dual therapy is needed, particularly for MRSA coverage. For patients at low risk of mortality and MDR pathogens, monotherapy may be appropriate, with some regimens optionally including coverage for Pseudomonas. Antibiotic dosing strategies also vary, with time-dependent antibiotics benefiting from prolonged infusions, while concentration dependent antibiotics like fluoroquinolones and aminoglycosides are more effective at higher peak concentrations. The widespread adoption of once-daily aminoglycoside dosing is based on evidence suggesting lower toxicity. The IDSA/ATS guidelines offer specific recommendations: using vancomycin or linezolid for MRSA-associated HAP/VAP, avoiding aminoglycoside monotherapy for Pseudomonas-associated HAP/VAP, and recommending combination therapy for Pseudomonas-associated HAP/VAP in

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patients with septic shock or high mortality risk until susceptibility results are available. No specific antibiotic class is recommended for extended-spectrum beta-lactamase-producing Gram-negative bacilli, while ampicillin/sulbactam or a carbapenem is preferred for susceptible Acinetobacter species, with tigecycline discouraged. The guidelines also stress antibiotic de-escalation and advise against using the Clinical Pulmonary Infection Score to guide treatment duration. These strategies aim to improve patient outcomes while minimizing unnecessary antibiotic use and reducing the development of resistance (30). A major limitation of retrospective evaluations is the challenge of fully understanding the reasons behind the initial discontinuation of antimicrobial therapy in some patients compared to others. While these studies accounted for factors like infectious signs, baseline comorbidities, and illness severity, there may still be unmeasured various between the study groups. The ATS/IDSA guidelines suggest using procalcitonin (PCT) levels, along with clinical criteria, to guide the discontinuation of antimicrobial therapy for VAP. This approach has been associated with reduced antibiotic exposure in several studies, although the average duration of therapy in these studies often exceeded current recommendations. The standard treatment duration for VAP is generally recommended to be 7 days. A 7-day regimen, compared to longer courses (8–15 days), reduces antibiotic exposure and the risk of VAP recurrence, particularly from multidrug resistant (MDR) organisms. However, for cases caused by non-fermenting Gram-negative bacilli, a 7-day course has been linked to higher recurrence rates, though mortality and clinical cure rates remain unaffected. This finding is controversial, as it is largely based on a single randomized controlled trial that relied more on microbiological rather than clinical criteria to determine VAP recurrence. Ultimately, the duration of therapy may need to be adjusted based on the patient's clinical, radiographic, and laboratory findings. Further research is needed to better understand the recurrence of VAP caused by non-fermenting Gram-negative organisms and to refine treatment duration guidelines (31).

**13. Prevention of ventilator associated pneumonia:**

Preventing VAP requires both pharmacological and non-pharmacological approaches, with an emphasis on modifiable risk factors. This pattern outlines the most widely recognized preventive measures. suggestion recommend using orotracheal and orogastric tubes for intubation instead of nasotracheal or nasogastric tubes, as oral intubation is linked to a lower incidence of VAP. A major risk factor associated with prolonged hospitalization is the frequent replacement of ventilator circuits. Current suggestion using a single ventilator circuit per patient, replacing it only if it is mechanically damaged or contaminated (e.g., by blood, vomit, or purulent secretions). Evidence shows that frequent circuit changes do not reduce the incidence of VAP. Bercault et al. found that transporting patients from the ICU to other hospital areas increases the risk of VAP. This is attributed to the supine position during transport and frequent manipulation of the ventilator tubing, which may lead to aspiration of contaminated secretions. For intra-hospital transfers, it is recommended to position the patient with an incline and to suspend enteral nutrition (EN) four hours before the transfer. Elevating the head of the bed helps avoid the supine position, which has a 0° incline and is a known risk determinant VAP, by reducing gastroesophageal reflux and aspiration into the lower airways. Head altitude is linked to a low risk of aspiration. A meta-analysis showed that a 15°–30° head elevation is insufficient to precaution VAP. Current guidelines recommend lowering the head of the bed to 30°–45°, with some studies suggesting that a 45° elevation may be more effective. The horizontal-lateral position with a 45° head high has also shown promise, with a decrease incidence of VAP (1/10 versus 4/10 in the semi recumbent position), but this approach is not yet included in official guidelines as further research is needed to clarify its effectiveness(32).

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## METHODOLOGY

### Study Design

Descriptive Cross Sectional study .

### Study Settings

The current study was conducted at Rehman medical institute (RMI) Hayatabad Peshawar

### Study Duration

Study duration for this research work was 6 months w.e.f January 2025 to June 2025.

### Sample Size

Calculated via using a formula $n= z^2 x p (1-p)/E^2$ where P is an estimated prevalence=16%E is margin of error taken as 5%. And Z for Confidence level of 95% is 1.96.

A sample of 206 patients will be selected among the population presenting with at Rehman Medical Institute, Peshawar, Khyber Pakhtunkhwa, Pakistan

### Sampling Technique

Non-Probability Convenient Sample technique.

Sample Selection

### Inclusion Criteria:

All patient 48 hours intubated and on mechanical ventilator

Exclusion Criteria

- Patients at admitted less than 48 hours.
- Patient with pneumonia before MV.

### Data Collection Procedure

Data were gathered from patients through self-administered questionnaires, and all completed forms were thoroughly reviewed.

### Data Analysis Procedure:

The data will be analyzed through SPSS 2.4 version.

### Ethical Consideration:

The designed study was ethically approved from the institutional health committee of RMI Peshawar.

## RESULTS

This study analyzed demographic, clinical, and procedural characteristics of 206 patients requiring mechanical ventilation. Key findings include a majority male population (59.7%), with adults aged 40–64 being most common. The primary reasons for ventilation were chronic kidney disease, unconsciousness, and shortness of breath, accounting for 75.7% of cases. Most patients (88.3%) needed ventilation for five days or less. No cases of ventilator associated pneumonia were observed, suggesting effective infection control. Endotracheal tubes were the preferred ventilation method, and bacterial infections were prevalent. Common comorbidities included diabetes, hypertension, and heart disease. This study underscores the importance of managing chronic conditions, preventing infections, and ensuring regular airway clearance for better patient outcomes.

### 1. Table 1. Gender of patients

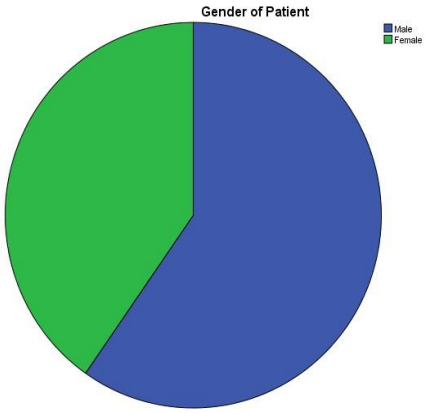
In this study a total of two hundred six (206) patient is analyzed to determine gender distribution gender is divided into two groups male and female among them (123) patients (59.7%) is male while 83 patient (40.3%) is female the cumulative percentage of the male patient is (59.7%) and the addition with the female patient the totally cumulative percentage (100%). This indicate that most of the patient in the sample is male.

**Gender of Patient**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Male | 123 | 59.7 | 59.7 | 59.7 |
| Female | 83 | 40.3 | 40.3 | 100.0 |
| Total | 206 | 100.0 | 100.0 | |

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**2. Table. 2 Age of patients**

In the recent study a total of two hundred six (206) patients analyzed and their ages is divided by five group. The age group with the highest representation is adult age 40-64 years comprising 81 patient (39.30%) and older adults aged 65 years and above with 62 patient (30.1%) young adults age 20-39 years accounted for 50 patient (24.3%) children aged 2-12 years represented smallest group with only 4 patient (1.9%).

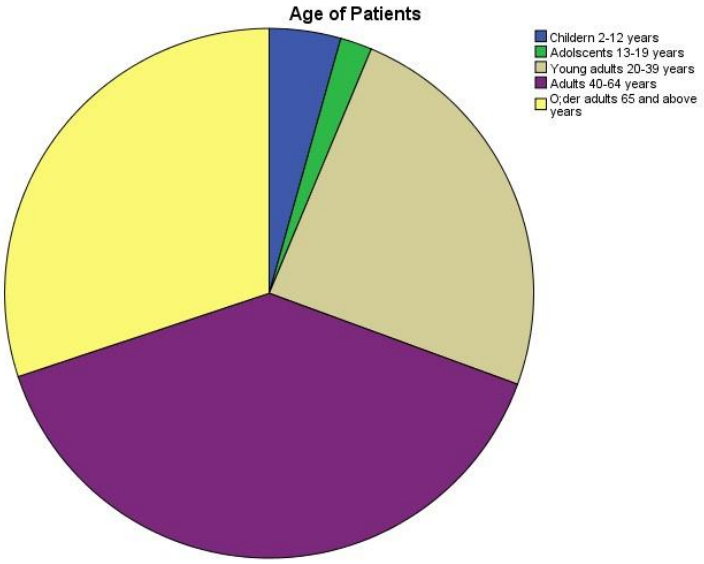
The cumulative percentage reached (69.9%) after including patients up to 40-64 years of age range and the total cumulative percentage reached (100%) with the addition of the after adults aged 65 years and above.

**Age of Patients**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Children 2-12 years | 9 | 4.4 | 4.4 | 4.4 |
| Adolescents 13-19 years | 4 | 1.9 | 1.9 | 6.3 |
| Young adults 20-39 years | 50 | 24.3 | 24.3 | 30.6 |
| Adults 40-64 years | 81 | 39.3 | 39.3 | 69.9 |
| Older adults 65 and above years Total | 62 | 30.1 | 30.1 | 100.0 |
| | 206 | 100.0 | 100.0 | |

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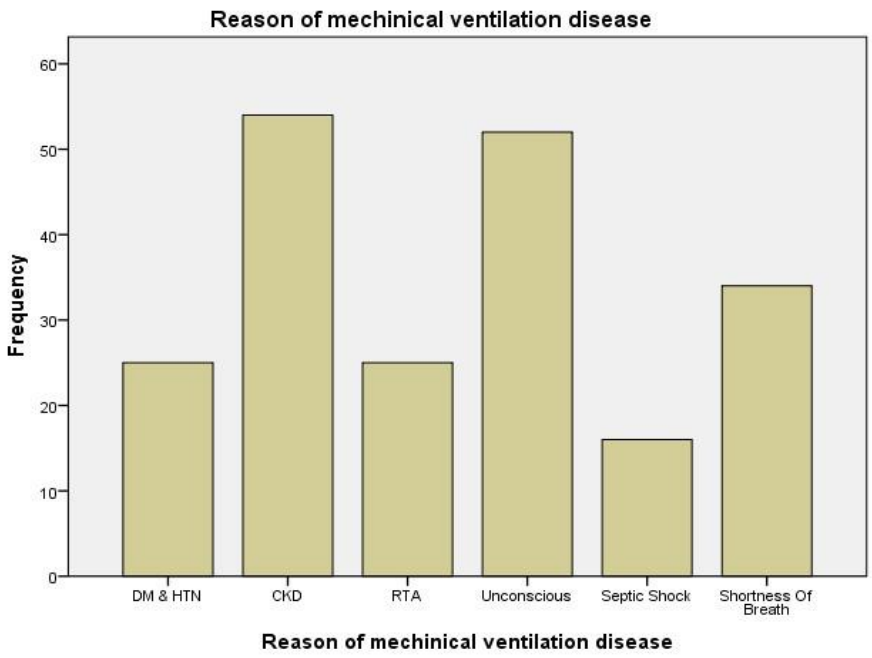

**3. Table. 3 Reason of mechanical ventilation disease**

A total two hundred six (206) patients required mechanical ventilation for a variety of reason. The leading cause is Chronic kidney disease CKD which affected 54 patients (26.2%) followed closely by Unconsciousness 52 patients (25.2%) Shortness of breath SOB is responsible for 34 patients (16.5%) while Diabetes mellitus DM and Hypertension HTN and Road traffic accidents RTA each have 25 patients (12.1%) septic shock is reported as the least frequency cause with 16 patient (7.8%). The cumulative percentage reveals that CKD unconsciousness and shortness of breath together accounted for more the three rest of the patient (75.7%) highlighted these are the are the main reason for mechanical ventilation in this population.

**Reason of mechanical ventilation disease**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| DM & HTN | 25 | 12.1 | 12.1 | 12.1 |
| CKD | 54 | 26.2 | 26.2 | 38.3 |
| RTA | 25 | 12.1 | 12.1 | 50.5 |
| Unconscious | 52 | 25.2 | 25.2 | 75.7 |
| Septic Shock | 16 | 7.8 | 7.8 | 83.5 |
| Shortness Of Breath | 34 | 16.5 | 16.5 | 100.0 |
| Total | 206 | 100.0 | 100.0 | |

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**4. Table .4 Mechanical ventilation duration**

In the recent study the length of time patients required mechanical ventilation varied wildly among the two hundred six 206patients individual included in this analysis. the duration most frequency observed in one day 1 and two day 2 with each duration affecting 57 patient (27.7%). 22 patients (10.7%) needed ventilation for three days 3 while 30 patients (14.6%) required four days 4 mechanical ventilation. duration of five 5, six days 6 and seven 7 days in sixteen (7.8) 5 (2.4) and 6 (2.9%) patients respectively. fewer patient experienced longer ventilation time with only a small number required mechanical ventilation support for eight days 8 comprising 3 patients (1.5%) and also 3 patient (1.5%) ventilated for twelve days 12. 1 patient each (0.5%) for ten 10 and fourteen 14 and sixteen days overall a significant majority (88.3%) of patients on mechanical ventilation for five days 5 suggesting that prolong duration were uncommon in this population

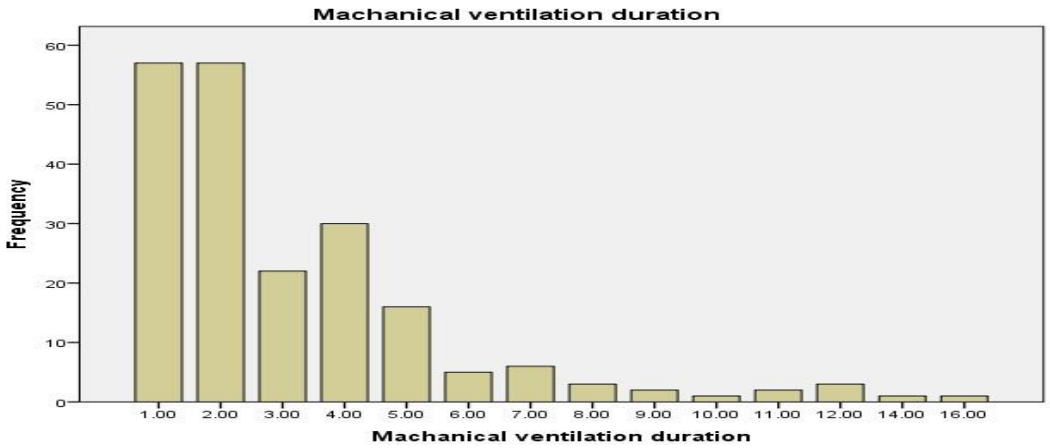
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**Mechanical ventilation duration**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| 1.00 | 57 | 27.7 | 27.7 | 27.7 |
| 2.00 | 57 | 27.7 | 27.7 | 55.3 |
| 3.00 | 22 | 10.7 | 10.7 | 66.0 |
| 4.00 | 30 | 14.6 | 14.6 | 80.6 |
| 5.00 | 16 | 7.8 | 7.8 | 88.3 |
| 6.00 | 5 | 2.4 | 2.4 | 90.8 |
| 7.00 | 6 | 2.9 | 2.9 | 93.7 |
| 8.00 | 3 | 1.5 | 1.5 | 95.1 |
| 9.00 | 2 | 1.0 | 1.0 | 96.1 |
| 10.00 | 1 | .5 | .5 | 96.6 |
| 11.00 | 2 | 1.0 | 1.0 | 97.6 |
| 12.00 | 3 | 1.5 | 1.5 | 99.0 |
| 14.00 | 1 | .5 | .5 | 99.5 |
| 16.00 | 1 | .5 | .5 | 100.0 |
| Total | 206 | 100.0 | 100.0 | |




**5. Table. 5 Diagnosis of ventilator associated pneumonia**

According to this data none of the two hundred six 206 patients 100% diagnosed with ventilator associated pneumonia. this indicated that ventilator associated pneumonia is not observed in any of the patient in this study. this data clearly indicates that there is no case of ventilator associated pneumonia in these patients. emphasizing the successful management or monitoring of factor which typically contribute to this condition in ventilated patients.

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**Diagnosis of ventilator associated pneumonia**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| NONE | 206 | 100.0 | 100.0 | 100.0 |

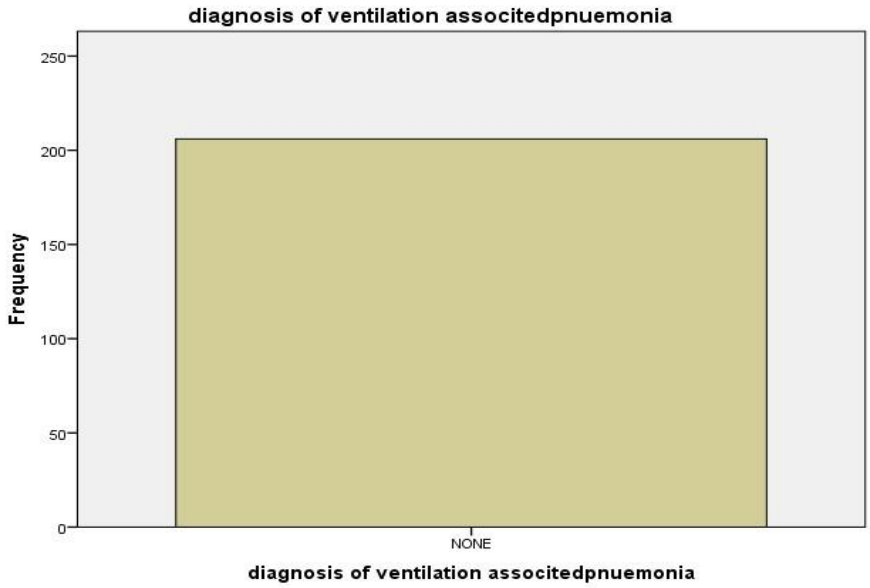



**Table .6 Duration of circuit change**

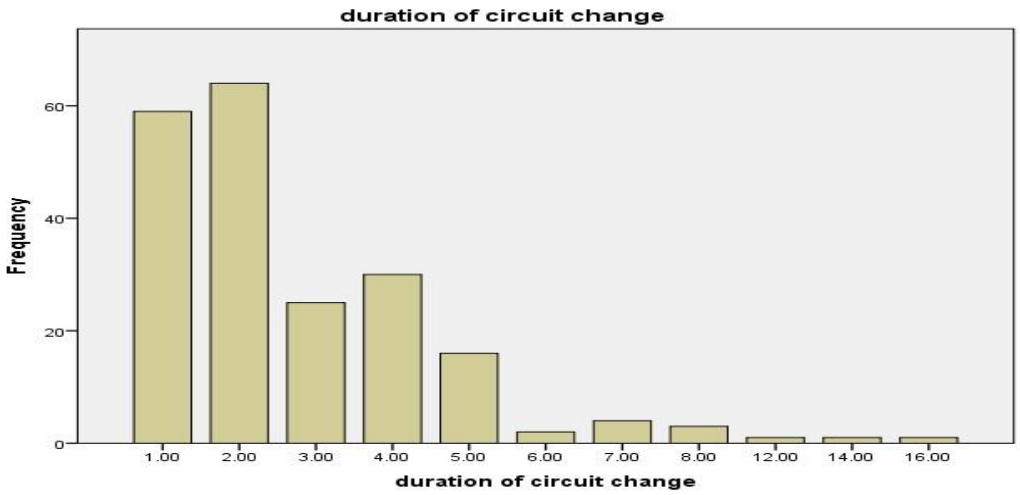
In recent study we focused on the duration of circuit change in a sample of two hundred six 206 patient. The most commonly reported circuit change duration is the 1 and 2 days representing 59 patients (28.6%) and 64 patient (31.1%) respectively .a patient circuit change .while duration of circuit change 3 three days observing in 25 (12.1%) fewer patients experienced duration of 5 five days (7.8%) 6 six days (1.0%) 7 seven days (1.9%) and 8 eight days (1.5%)very few patient face longer duration with only 1 one patient each in the 12 twelve 14 fourteen and sixteen days (0.5%) overall most of the circuit and change in one 1 and four 4 days covering (86%) patients indicating a concentration of shorter duration .

Duration of circuit change

| | | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|---|
| | 1.00 | 59 | 28.6 | 28.6 | 28.6 |
| | 2.00 | 64 | 31.1 | 31.1 | 59.7 |
| | 3.00 | 25 | 12.1 | 12.1 | 71.8 |
| | 4.00 | 30 | 14.6 | 14.6 | 86.4 |
| | 5.00 | 16 | 7.8 | 7.8 | 94.2 |
| | 6.00 | 2 | 1.0 | 1.0 | 95.1 |
| | 7.00 | 4 | 1.9 | 1.9 | 97.1 |
| | 8.00 | 3 | 1.5 | 1.5 | 98.5 |
| | 12.00 | 1 | .5 | .5 | 99.0 |
| | 14.00 | 1 | .5 | .5 | 99.5 |
| | 16.00 | 1 | .5 | .5 | 100.0 |
| | Total | 206 | 100.0 | 100.0 | |

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**6. Table .7 ventilator connection**

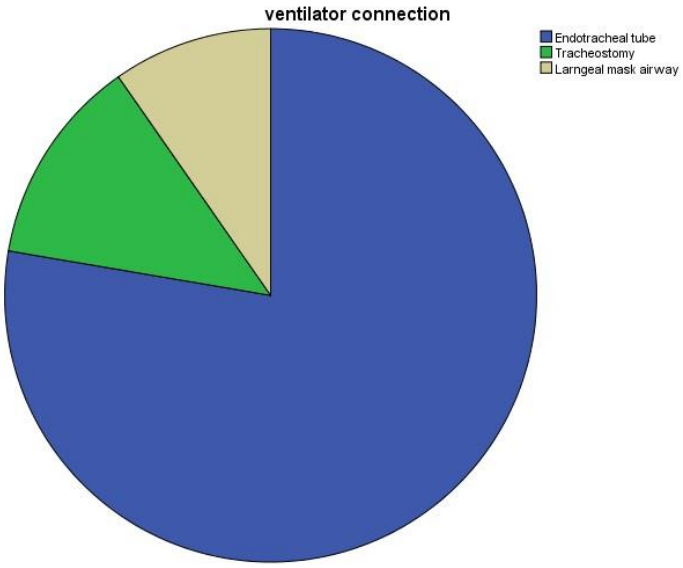
Recent this study total two hundred six 206 patient is analyzed on term ventilator connection methods. The majority of patients one hundred sixty (77.7%) connected via an through endotracheal tube. a smaller group consisting of 26 twenty-six patient (12.6%) is connection established via tracheostomy while remaining 20 twenty patients (9.7%) is connection using a laryngeal mask air way these results highlight notable preference for the use of a endotracheal tube for the ventilator connection in the patient

**ventilator connection**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Endotracheal tube | 160 | 77.7 | 77.7 | 77.7 |
| Tracheostomy | 26 | 12.6 | 12.6 | 90.3 |
| Laryngeal mask airway | 20 | 9.7 | 9.7 | 100.0 |
| Total | 206 | 100.0 | 100.0 | |

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**7. Table .8 Infection agent after culture and sensitivity**

Among two hundred six 206 patient one hundred eighty-six 186 patients (90.3%) is diagnosed with bacterial infection where 20 patients (9.7%) is diagnosed with viral infection. this indicate that bacterial infection is the most prevalent types of the infection viral is comparatively rare.

**infectious agent after culture and sensitivity**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Virus | 20 | 9.7 | 9.7 | 9.7 |
| Bacteria | 186 | 90.3 | 90.3 | 100.0 |
| Total | 206 | 100.0 | 100.0 | |

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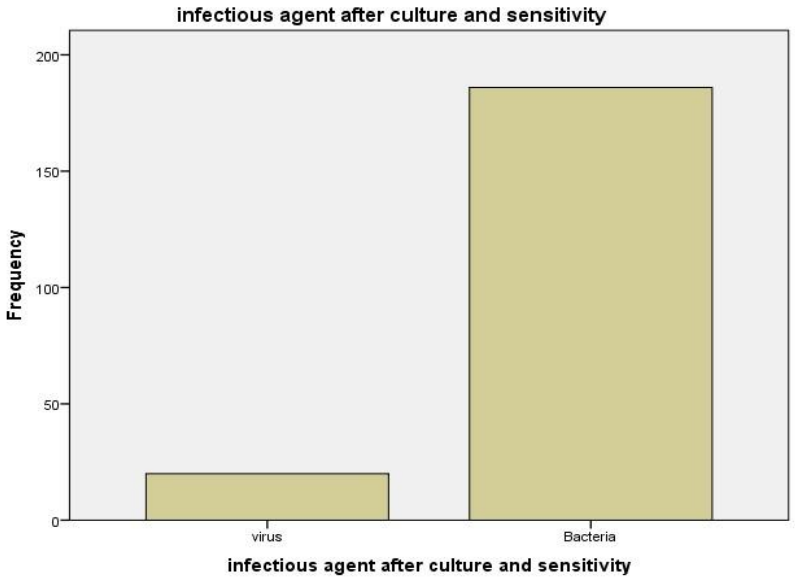



**Table .9 smoking status**

Total one hundred six patients 206 Smoking status among them 28 patients (13.6%) identified as smoker while 178 patients (86.4%) stated that they are none smoker. this show that significant majority of the patient (84.4%) do not smoker with only minor friction (13.6%) describing themselves as a smoker.

**smoking status**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Yes | 28 | 13.6 | 13.6 | 13.6 |
| No | 178 | 86.4 | 86.4 | 100.0 |
| Total | 206 | 100.0 | 100.0 | |

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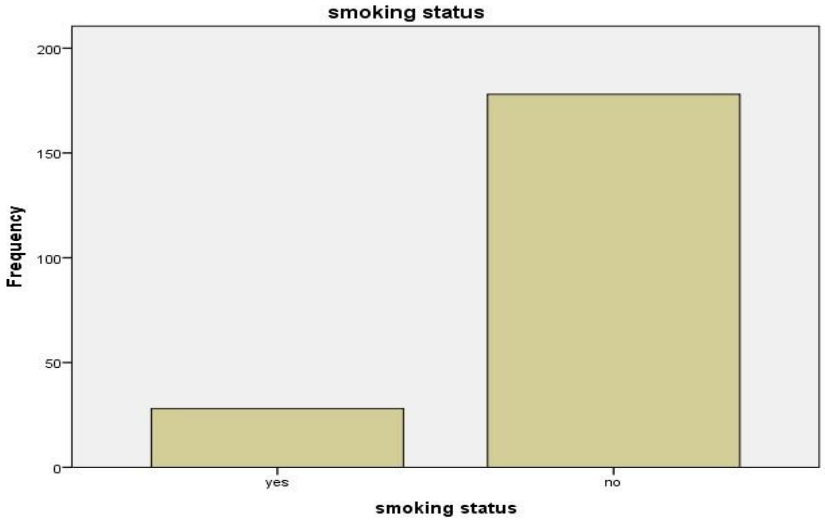
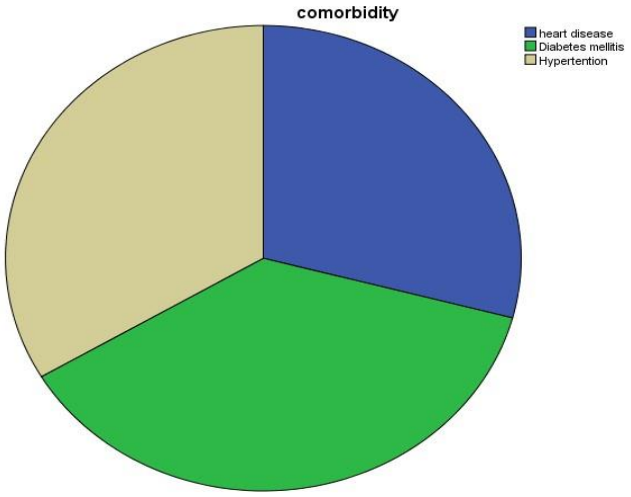



**Table.10 comorbidity**

In this study total two hundred six 206 patient in which we analyzed occurrence of comorbidity. Among them sixty 60 patient (29.1%) suffer from heart disease and seventy-seven 77 patient (34.4%) reported suffering from diabetes mellitus and sixty-nine 69 patients reported suffer from hypertension the most prevalent comorbidity among the all patient in diabetes mellitus (37.4%) hypertension is 33.5% among all the patient and heart disease is (29.1%).

**Comorbidity**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| heart disease | 60 | 29.1 | 29.1 | 29.1 |
| Diabetes mellites | 77 | 37.4 | 37.4 | 66.5 |
| Hypertension | 69 | 33.5 | 33.5 | 100.0 |
| Total | 206 | 100.0 | 100.0 | |



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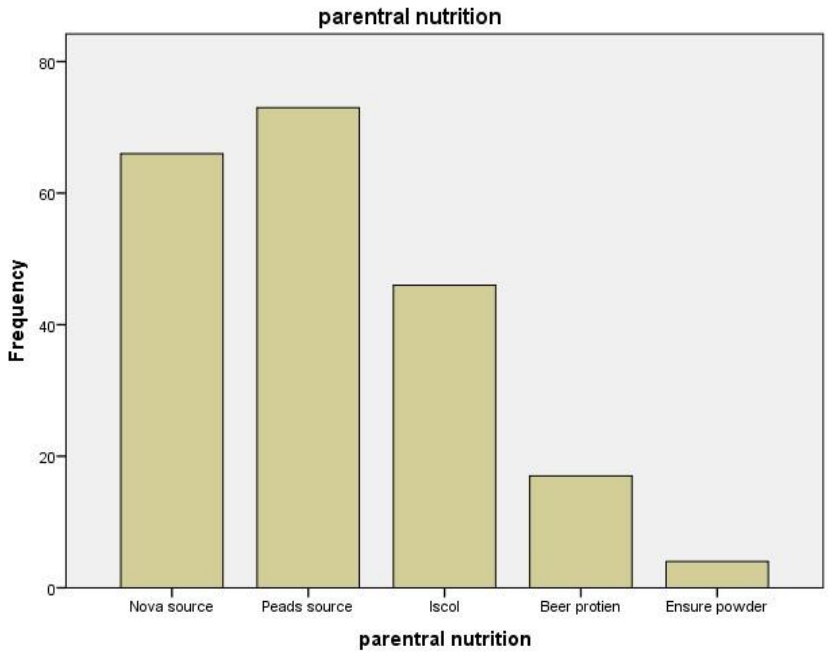
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**8. Table. 11 parenteral nutrition**

This examination involving two hundred six 206 patients the source of parenteral nutrition analyzed. Pead's source is most frequently used in seventy-three 73 patient (35.4%). Nova source is the 2nd most used in the sixty-six 66 patient (32%) iscol is used by forty-six 46 patient (22.3%) while beer protein is used by forty-seven 47 patient (8.3%) and ensure powder is used by four 4 patient (1.9%) collectively Pead's source and nova source is dominant parenteral nutrition representative (67.4%) of the total patients.

**Parenteral nutrition**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| Nova source | 66 | 32.0 | 32.0 | 32.0 |
| Pead's source | 73 | 35.4 | 35.4 | 67.5 |
| Iscol | 46 | 22.3 | 22.3 | 89.8 |
| Beer protein | 17 | 8.3 | 8.3 | 98.1 |
| Ensure powder | 4 | 1.9 | 1.9 | 100.0 |
| Total | 206 | 100.0 | 100.0 | |




**9. Table .12 suction perform a days**

According to the analysis of daily suction need among two hundred six 206 patients. the largest group required suction five 5 time a day (34.0% equivalent to 70 patient) while the second group needed 4 four-time suction per day (30.6% or 63 patient). A lesser proportion of patients required suction three 3time per day (18.0% or 37 patient and 12.1% (25 patient) needed it 6 six time per day. A small number of patients required suction two 2 time a day (3.9%) or eight 8 patient seven 7 time a day suction required (0.5%) or one 1 patient the data indicates that most of the patient required suction between four 4 or five 5 times daily which account for (64.6%) of the cases.

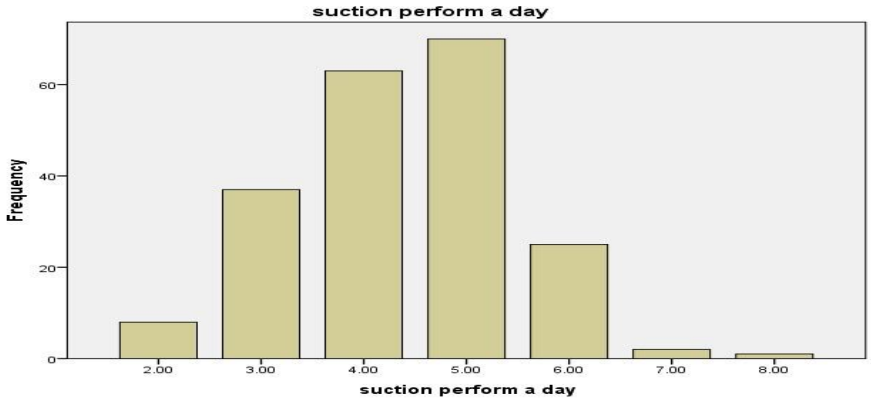
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**Suction perform a day**

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|---|---|---|---|
| 2.00 | 8 | 3.9 | 3.9 | 3.9 |
| 3.00 | 37 | 18.0 | 18.0 | 21.8 |
| 4.00 | 63 | 30.6 | 30.6 | 52.4 |
| 5.00 | 70 | 34.0 | 34.0 | 86.4 |
| 6.00 | 25 | 12.1 | 12.1 | 98.5 |
| 7.00 | 2 | 1.0 | 1.0 | 99.5 |
| 8.00 | 1 | .5 | .5 | 100.0 |
| Total | 206 | 100.0 | 100.0 | |




## DISCUSSION

Ventilator-associated pneumonia (VAP) it kind of nosocomial infection that arises at least forty-eight hours 48 after the start of mechanical ventilation. It can be caused by factors such as contaminated ventilator tubing condensate, reduced gastrointestinal function due to antibiotic use, stress ulcer prophylaxis, supine positioning of the head, parenteral nutrition, nasogastric intubation, poor hand hygiene (19). The onset of VAP is mainly driven by the complex interactions among the endotracheal tube, various risk factors, the aggressiveness of invasive bacteria, and the body's immune response (20). Pneumonia rates in intubated patients are six to twenty-one times higher, with the risk increasing as mechanical ventilation is prolonged. The incidence of VAP varies based on the population, ranging from 6 to 52 cases per 100 patients (21)

In our study, a total of 206 patients were analyzed. a age group with the highest representation was adults aged 40-64 years, consisting of 81 patients (39.3%). The University of Medical Sciences in Hamadan, Iran conducted a screening of 129 patients, of which 85 were involve in the lest analysis. The most age of the participants was 46.94 ± 18.90 years, with a prevalence of males (72.9%) (28)

In our study, patients required mechanical ventilation for various reasons. The most common cause was chronic kidney disease (CKD), which affected 54 patients (26.2%), followed closely by unconsciousness, which impacted 52 patients (25.2%). the study was carried out at Methodist Healthcare University Hospital, where 167 patients (41.75%) could not be extubated at 8 hours, 27 patients (6.75%) at 24 hours, and 21 patients (5.25%) at 48 hours. The most frequent reason for failed extubating (FTE) was a depressed level of consciousness, observed in 58 of the 167 patients (34.7%). The primary cause of The prolonged sedation resulting from anesthetic agents, which affected 51 patients, led to a depressed level of consciousness (30.5%) (39).

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In our study no one single patient is observed with ventilator associated pneumonia. This indicated that ventilator associated pneumonia was not observed in any of the patients in this study. According to Alvaro Rea-Neto el at There is A single clinical symptom cannot be used independently to diagnose VAP. While chest radiology is highly sensitive, it is generally nonspecific (37).

In our study, 186 patients (90.3%) were diagnosed with bacterial infections, while 20 patients (9.7%) had viral infections. According to Alvaro Rea-Neto et al., around 70% of ventilator-associated

pneumonia (VAP) cases are caused by Gram-negative bacteria. Flanagan et al. reported elevated endotoxin concentrations in both bronchoscope-guided and non-directed bronchoalveolar lavage (BAL) fluid in patients with VAP (37).

In our study, the occurrence of comorbidities was as follows: 60 patients (29.1%) had heart disease, 77 patients (34.4%) had diabetes mellitus, and 69 patients (33.5%) had hypertension. Among all the patients, the most prevalent comorbidity was diabetes mellitus (37.4%), followed by hypertension (33.5%) and heart disease (29.1%).

Additionally, records of 157 subjects were reviewed. The medal age of this cohort was 60 years (range 22–97 years), with 58.6% identifying as African American and 36.9% as white. The most common comorbidities in this group were hypertension (63.1%), diabetes mellitus (43.3%), and cerebrovascular accidents (29.9%)(40).

In our study, the methods of ventilator connection varied among patients. Most patients, 160 (77.7%), were connected via an endotracheal tube. A smaller group of 26 patients (12.6%) had their connection established through a tracheostomy, while the remaining 20 patients (9.7%) were connected using a laryngeal mask airway. These findings highlight a clear preference for the use of an endotracheal tube for ventilator connection.

Similarly, a study conducted at Kasr Alainy Hospital and Damanhur Medical National Institute involved 137 patients initially planned for tracheostomy. However, 17 patients (12.4%) were excluded, leaving 120 patients (87.6%) in the research. These 120 patients were divided 2 group: 60 patients (50%) in the endotracheal tube (ETT) group and 60 patients (50%) in the laryngeal mask airway (LMA) group (41).

In our study, the most reported durations for circuit changes were 1 and 2 days, affecting 59 patients (28.6%) and 64 patients (31.1%), respectively. The duration of circuit change for 3 days was observed in 25 patients (12.1%), while fewer patients experienced longer durations, with 5 days reported by 7.8% of patients, 6 days by 1.0%, 7 days by 1.9%, and 8 days by 1.5%. Very few patients faced even longer durations, with only 1 patient each experiencing circuit changes at 12, 14, and 16 days (0.5%). Overall, many circuit changes occurred within 1 to 4 days, covering 86% of the patients. A study conducted at Chang Gung Children's Hospital found that initial occurrence VAP occurred in 66.7% (4/6) of patients during three-day group and 50.0% (4/8) in the seven-day group. Mortality rates were

21.7% (10 patients) in the three-day group and 36.0% (18 patients) in the seven-day group (19)

## CONCLUSION

This study highlights that most mechanical ventilated patient is middle aged male and female with chronic kidney disease unconsciousness and shortness of breath as primary cause no case of ventilator associated pneumonia is observed in this study. this study underscores the importance of managing chronic condition preventing infection and ensuring regular airway clearance for better patient outcome

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