Assessment of nurses knowledge and Performance regarding prevention of Ventilator associated pneumonia in Intensive Care Unit in Omdurman military hospital during the period of study August 2017.

A Thesis submitted in partial fulfillment of the requirements for MSC degree in critical care nursing.

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2017

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I

Dedication

I dedicate this research to my parents who have played a

great role in my education till I reach this level

To my brother and sisters

To supervisor Dr. Mariam Elnageib

To my collage and all nurses

Acknowledgement

First I deeply thank Allah

It is difficult to acknowledge properly those who have helped me in the preparation of this research . but I extremely great full to supervisor : Dr Mariam Elnageib for her great assistance and effective cooperation I deep thanks and appreciations to everyone who directly or indirectly help me And I send thank to all nurses in Omdurman military hospital Finally I express deep appreciations to the nursing teachers in shundi university .

Abstract

ventilator associated pneumonia is considered to be one of the important unsolved problems around the world. A lack of knowledge regarding prevention of ventilator associated pneumonia among nurses decrease compliance with these practices around the world. This descriptive hospital-based study was conducted in Omdurman Military Hospital, It aimed at assessing knowledge and practice of nurses regarding prevention of ventilator associated pneumonia in Intensive Care Unit(ICU). The study covered 60 nurses .They constitute the available sample during the study period2016-2017. Data were collected by a questionnaire designed and checklist for the study. Data were analyzing using the Statistical Packages for Social Sciences (SPSS). The study showed (50%) of nurses had goodknowledge about definition of ventilator associated pneumonia, and (55%) of nurses had poor knowledge about type of air way humidifier , (13.3%) of nurses had good knowledge about types of endotracheal tube and The most of nurses (85%) used open suction. The study showed about performance of prevention of ventilator associated pneumonia (60%) of nurses had poor knowledge . The study concluded that knowledge of intensive care unit nurses staff could be improved by providing them with well-organized practical training. The study recommended that there is providing training programs for the newly joined ICU nurses about prevention of ventilator associated pneumonia at regular intervals is recommended.

الخلاصة

ويعتبر الالتهاب الرئوي المرتبط بالتنفس الصناعي واحد من المشاكل المهمة التي لم تحل حول العالم . نقص المعرفة بشأن الوقاية من الالتهاب الرئوي المرتبط بالتنفس الصناعي بين الممرضين يقلل من الامتثال لهذه الممارسات في جميع أنحاء العالم.

أجريت هذه دراسة الوصفية في مستشفى أم درمان العسكري، والتي تهدف إلى تقييم معرفة وممارسة الممرضات بشأن الوقاية من الالتهاب الرئوي المرتبط بالتنفس الصناعي في وحدة العناية المركزة. وشملت الدراسة 60 ممرضة، وهي تشكل العينة المتاحة خلال فترة الدراسة 2016-2017

تم جمع البيانات من خلال استبيان صمم و قائمة مرجعية للدراسة. تم تحليل البيانات باستخدام الحزم الإحصائية للعلوم الاجتماعية (سبس) وأظهرت الدراسة أن (50٪) من الممرضات لديهم معرفة جيدة بتعريف الالتهاب الرئوي المرتبط بالتنفس الصناعي، و (55%) من الممرضات لديهن معرفة ضعيفة حول نوع مرطب جهاز التنفس الصناعي ،(13.3٪) من الممرضات لديهم معرفة جيدة عن أنواع الأنبوب الرغامي، واستخدم معظم الممرضات (85٪) الشفط المفتوح وأظهرت الدراسة عن أداء الوقاية من الالتهاب الرئوي المرتبط بالتنفس الصناعي (60٪) من الممرضات لديهم معرفة ضعيفة. وخلصت الدراسة إلى أنه من الممكن تحسين المعرفة بممرضات وحدة العناية المركزة عن طريق تزويدهم بالتدريب العملي الجيد التنظيم. وأوصت الدراسة أن هناك توفير برامج تدريبية للممرضات اللاتي انضموا حديثا الى العناية المركزة حول الوقاية من الالتهاب الرئوي المرتبط بالتنفس الصناعي على فترات منتظمة.

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Abbreviations

(CDC)	Center for Disease Control
(COPD)	Chronic Obstructive Pulmonary Disease
(EBGs)	Evidence-Based Guidelines
(HBN)	Health Building Note
(HCAI)	health care associated infection
(HTM)	Health Technical Memorandum
(ICU)	Intensive Care Units
(NIV)	non-invasive ventilation
(NNISS)	National Nosocomial Infection Surveillance System
(SDD)	selective digestive decontamination
(SOD)	selective oral decontamination
(VAP)	Ventilator Associated Pneumonia

Introduction

Ventilator-associated pneumonia (VAP) is one of the most commonly encountered hospital-acquired infections in intensive care units and is associated with significant morbidity and high costs of care. The pathophysiology, epidemiology, treatment and prevention of VAP have been extensively studied for decades, but a clear prevention strategy has not yet emerged. In this article we will review recent literature pertaining to evidence-based VAP-prevention strategies that have resulted in clinically relevant outcomes. A multidisciplinary strategy for prevention of VAP is recommended. Those interventions that have been shown to have a clinical impact include the following: Non-invasive positive pressure ventilation for able patients, especially in immune compromised patients, with acute exacerbation of chronic obstructive pulmonary disease or pulmonary oedema, Sedation and weaning protocols for those patients who do require mechanical ventilation, Mechanical ventilation protocols including head of bed elevation above 30 degrees and oral care, and Removal of subglottic secretions. Other interventions, such as selective digestive tract decontamination, selective oropharyngeal decontamination and antimicrobial-coated endotracheal tubes, have been tested in different studies. However, the evidence for the efficacy of these measures to reduce VAP rates is not strong enough to recommend their use in clinical practice. In numerous studies, the implementation of VAP prevention bundles to clinical practice was associated with a significant reduction in VAP rates. Future research that considers clinical outcomes as primary endpoints will hopefully result in more detailed prevention strategies [1].

VAP is the leading cause of death among hospital-acquired infections, exceeding the rate of death due to central line infections, severe sepsis, and respiratory tract infections in the non-intubated patient. VAP also prolongs time spent on the ventilator, length of ICU stay, excess use of antimicrobial medications and length of hospital stay after discharge from the ICU. For 2010, NHSN facilities reported more than 3,525 VAPs and the incidence for various types of hospital units ranged from 0.0-5.8 per 1,000 ventilator days. The total annual direct medical costs for VAP in United States hospitals is $1.03 billion to $1.50 billion. Ventilator Associated Pneumonia (VAP) is a high-risk disease for patients on mechanical ventilation. Attributable mortality may be as high as 40 [2]. In 2011, an estimated 157,000 healthcare-associated pneumonias occurred in acute care hospitals in U.S.[1] Patients with mechanically-assisted ventilation have a high risk of developing healthcare-associated pneumonia [3].

Justification

The Ventilator-associated pneumonia the major causes infection of ICU. The nurses need more information about VAP to solve and reduce ventilator associated pneumonia **,** The reduction of VAP in ICU is a key international goal. Evidence health's to reduce deaths need reliable and valid information specially the majority of causes are preventable .

Objectives

General Objective

To study assessment of nurses knowledge and practice regarding prevention of Ventilator associated pneumonia in Intensive Care Unit in Omdurman military hospital during the period of study 2017.

Specific Objectives

1. To assess   knowledge of   nurses regarding ventilator associated pneumonia.
2. To assess nurses performance regarding prevention   ventilator associated pneumonia use methods and control guidelines .

3.To determine co-relation between level of education and prevention of VAP.

.Literature review

Pneumonia accounts for nearly 15% of all hospital acquired (nosocomial) infections and 24% to 27% of all those acquired in coronary care units and medical intensive care units (ICU) respectively. Ventilator-Associated Pneumonia (VAP) is a serious complication of mechanical ventilation which increases the patient's stay in the ICU and overall length of hospital stay and adds to overall costs. VAP is the most common of all nosocomial infections which contribute to death. In spite of extensive world wide efforts to understand, prevent and treat this complication, a mortality rate of approximately 30% still exists. Several organizations and institutions have recommended strategies and approaches in an effort to address this problem. Evidence-Based Guidelines (EBGs) have been published, but there is still large variability in conformance by both physicians and nurses.There are principles and strategies which make Best Practice possible. This program will outline these strategies and discuss their impact on VAP [4].

Definition of VAP

These definitions are lengthy and complicated with standardized performance indicators for the monitoring of and definitions for pneumonia. Mayall defines VAP as "pneumonia in patients who have been on mechanical ventilation for greater than 48 hours. The following discussion will use Mayall's definition [5]. Ventilator Associated pneumonia (VAP) is defined as Nosocomial pneumonia in a patient on mechanical ventilatory support (by endotracheal tube or tracheostomy) for > 48 hrs [6] .Ventilator-associated pneumonia (VAP) is the most frequent infection in patients

admitted to ICU and is associated with an increase in days of ICU stay, morbidity and mortality [7].

Microbiology

VAP is a bacterial pneumonia which develops in patients receiving mechanical ventilatory support through an artificial airway. If the infection occurs within 48 to 72 hours, it is called "early-onset". Early-onset pneumonia is usually caused by one of the following bacteria:

• Staphylococcus aureus (gram positive)

• Haemophilus influenzae (gram negative)

• Streptococcus pneumoniae (gram positive)

These are antibiotic sensitive strains which are common in the ICU.

Late-onset VAP is defined as pneumonia occurring after 72 hours of ventilation and is usually caused by:

• Methicillin Resistant Staphylococcus aureus (MRSA)

• Pseudomonas aeruginosa

• Acinetobacter or Enterobacter

In most patients, VAP is caused by multiple organisms

Signs and Symptoms of VAP

• Chest X-ray showing new or progressive diffuse infiltrate which is not attributable to any other cause

• Onset of purulent sputum

• Fever greater than 38.5°C (101°F)

• Leukocytosis

• Positive sputum or blood cultures [8].

VAP Risk Factors

Host or patient risk factors include:

• age of 65 or more

• underlying chronic illness (e.g. Chronic Obstructive Pulmonary Disease (COPD), emphysema, asthma)

• immunosuppression

• depressed consciousness

• thoracic or abdominal surgery

• previous antibiotic therapy

• previous pneumonia or remote infection

• instillation of normal saline

• understaffing

• nonconformance to hand washing protocol

• indiscriminate use of antibiotics

• lack of training in VAP prevention [9].

Protocol of prevention of ventilator associated pneumonia:-

1-Nursing and Respiratory care:-

• Elevate the head of the bed at an angle of 30-45 degrees for a patient at high risk for aspiration in the absence of medical contraindications.

• Cuff pressure should be maintained at 20-25 cm H2O.

• Circuit changes should occur when visibly soiled rather than routinely.

• Heat and moisture exchangers should not be changed more frequently than every 48 hours or when they become visibly soiled or mechanically malfunction.

• Assess the oral cavity and provide oral care every 6-8 hours and as needed, using a 0.12% or 2% chlorhexidine solution. Apply water-soluble mouth moisturizer and/or lip balm every 6-8 hours (after oral care) and as needed to maintain moisture.

• Use a dedicated suction line for endotracheal tube suctioning of respiratory secretions. Rotate position of oral endotracheal tube not less than every 24 hours. If endotracheal dorsal lumen is used, remove deep oral/subglottic secretions continuously per manufacturer's recommendations.

• Evaluate for kinetic bed therapy.

• Assess patient for daily sedation reduction/discontinuation and implement per institution's guidelines.

Reduce or discontinue sedation until patient is awake and can follow simple commands OR patient becomes agitated.

• Assess eligibility for daily weaning trials unless contraindicated.

2-Medications:-

• Assess for stress ulcer prophylaxis and ongoing use.

• It is recommended that all patients on admission to a critical care unit be assessed for their risk of venous thromboembolism, and receive thrombo prophylaxis based on that risk.

Head of Bed

In the absence of medical contraindications, elevate the head of the bed at an angle of 30-45 degrees for a patient at high risk for aspiration (e.g., a person receiving mechanically assisted ventilation and/or who has an enteral tube in place) (Centers for Disease Control and Prevention. Maintaining the head of the bed at greater than 30 degrees may be difficult. Lower elevations (20-30 degrees) may not prevent ventilator-associated pneumonia compared to a "control" elevation of 10 degrees .

Cuff Pressure

Cuff pressure should be maintained at 20-25 cm H2 O. Minimal leak technique is discouraged. noted that low intracuff pressure may be a risk factor for ventilator-associated pneumonia. His data demonstrated a benefit for maintaining cuff pressure in the endotrachael tube above 20 mmHg. As a secondary outcome to his study of continuous aspiration of subglottic secretions, low cuff pressures were associated with a higher risk of ventilator-associated pneumonia for patients not receiving antibiotics .

Circuit Changes

Less frequent changes do not lead to increased incidence of ventilator-associated pneumonia. Circuit changes should occur when visibly soiled rather than routinely

Heated Humidifiers, and Heat and Moisture Exchangers

The Centers for Disease Control and Prevention makes no preferential recommendation regarding the use of heated humidifiers or heat and moisture exchangers. There is insufficient evidence to conclude that the ventilator-associated pneumonia rate differs in patients ventilated with heated humidifiers compared to heat and moisture exchangers, especially if double-heater wire circuit technology is used in the latter . The Centers for Disease Control and Prevention recommends that heat and moisture exchangers not be changed more frequently than every 48 hours or when they become visibly soiled or mechanically malfunction.

• Heat and moisture exchangers

must be changed when they are visibly soiled. • Heat and moisture exchangers should be placed vertically above the tracheal tube, and nurses and doctors should repeatedly check the position. Because these studies were conducted on adult populations in an intensive care unit setting, other studies are required to determine the safety of extended heat and moisture exchangers use in other populations such as pediatric patients and long-term ventilator-dependent patients.

Oral Care

A randomized controlled trial and a meta-analysis evaluated the effectiveness of oral decontamination with a 2% chlorhexidine solution for the prevention of ventilator-associated pneumonia. The patient received a 2% chlorhexidine solution or normal saline solution four times per day until endotracheal tube removal. The incidence of ventilator-associated pneumonia, oropharyngeal colonization with gram negative bacilli and overall mortality showed no difference reduction in the rate of ventilator-associated pneumonia in the chlorhexidine group.

Secretion Removal with Specially Designed Endotracheal Tube

The American Thoracic Society document recommends continuous aspiration of subglottic secretions; the use of a specially designed endotracheal tube has significantly reduced the incidence of early-onset ventilator associated pneumonia in several. Due to the risk of the high aspiration of subglottic secretions during an endotracheal tube switch, changing out a standard endotracheal tube for an endotracheal tube with a subglottic suction lumen is not recommended. The Centers for Disease Control and Prevention states that if feasible, use an endotracheal tube with a dorsal lumen above the endotracheal cuff to allow drainage (by continuous or frequent intermittent suctioning) of tracheal secretions that accumulate in the patient's subglottic area . Before deflating the cuff or removing the tube for endotracheal tubes without a dorsal lumen, ensure that secretions are cleared from above the tube cuff. **Closed, In-Line Suctioning**

This work group concludes that the evidence on closed, in-line suctioning is varied; therefore, at this time it will not be included in the protocol. An

article by Freytag, et al. supports the view that application within 72 hours significantly enhances the microbial growth in the lower respiratory tract. Normal saline instilled with endotracheal suctioning may lead to dispersion of microorganisms into the lower respiratory tract. However, when using closed systems, the exposure to hospital personnel is significantly decreased The Centers for Disease Control and Prevention makes no preferential recommendation for use of either the multi-use closed suction system or the single-use open suction system .

Kinetic Bed Therapy

In 2004, a prospective, randomized, multicenter study found that kinetic bed therapy significantly decreased the occurrence of ventilator-associated pneumonia and lobar atelectasis . pneumonia but it does not seem to reduce other important outcomes such as mortality or ventilation duration. Because it requires a special bed that may not be available to all ICUs, we do not make a strong recommendation that it be used routinely in ventilated patients.

Sedation Reduction

Regular testing of the patient's ability to sustain adequate ventilation, oxygenation and breathing comfort (e.g., spontaneous breathing trial) has been shown to significantly reduce duration of mechanical ventilation for acute respiratory failure. Daily cessation (after the second day of intubation) of continuous infusions of sedative medications decreases the duration of mechanical ventilation and decreases diagnostic testing to evaluate impaired mental status that occurs after intensive care admission Use of a sedation algorithm that frequently adjusts sedative and analgesics doses to promote

tolerance of the intensive care unit environment while maintaining wakefulness was also shown to reduce the duration of mechanical ventilation .Individual intensive care units can modify the above research protocols for local circumstances, but essential elements of these protocols include regular patient assessment by a sedation scale, daily dose cessation or hourly dose reduction if patients are considered over sedated, use of opiates as a co-sedative if pain is likely, and use of bolus therapy to achieve adequate sedation before increasing the continuous infusion rate. The main contraindication to sedative cessation is neuromuscular blockade, and severe respiratory failure and life-support withdrawal are relative contraindications.

Weaning Readiness

Daily (or more frequently), brief weaning trials allow early assessment of patients' ability to sustain ventilation, oxygenation, breathing comfort and hemodynamic stability. Studies have shown that respiratory therapist or nurse-driven protocols that communicate to physicians the patient's tolerance and physiological response to 30-60 minutes of unsupported (e.g., continuous positive airway pressure [CPAP] or t-piece) or minimally supported breathing (e.g., pressure support of 7 cm H2O) leads to decreased duration of mechanical ventilation. Clinical judgment is necessary in the decision to extubate patients, incorporating the results of the weaning trial but also the patient's level of consciousness, airway stability, illness course and hemodynamic status.

2. Medications

Stress Ulcer Prophylaxis

The Centers for Disease Control and Prevention make no recommendation for the preferential use of sucralfate, H2-antagonists, and/or antacids for stress-bleeding prophylaxis in patients receiving mechanically assisted ventilation. Stress ulcer prophylaxis is used clinically in various strategies of prevention in the critical, intensive care patient. The recommendation of a particular regimen will, in part, depend upon which primary outcome a provider is focusing his/her efforts of prevention.His conclusion is that there is convincing evidence to suggest interventions can be employed to prevent hospital-acquired pneumonia or ventilator-associated pneumonia. The evidence-based interventions focus on the prevention of aerodigestive tract colonization (avoidance of unnecessary antibiotics and stress ulcer prophylaxis, use of sucralfate for stress ulcer prophylaxis, selective digestive decontamination, short-course parenteral prophylaxis in high-risk patients

Venous Thromboembolism Prophylaxis

Venous thromboembolism prophylaxis is recommended for most patients in the intensive care unit or with risk factors for venous thromboemboli. reviewed prevention of thromboembolism for a wide range of clinical conditions . The following statements can be made based on the evidence presented in this reference.

General Venous Thromboembolism Recommendations:

• The rationale for the use of thromboprophylaxis is based on solid principles and scientific evidence.

Most hospitalized patients have one or more risk factors for venous thromboembolism, and the risk factors are generally cumulative.

• There is a strong association between asymptomatic deep venous thrombosis and the subsequent development of symptomatic venous thromboembolism.

• The prevention of fatal (or any) pulmonary embolus is the top priority, and this outcome is uncommon.

The prevention of symptomatic deep venous thrombosis and pulmonary embolus is important since these occurrences are associated with considerable acute mortality, substantial costs and long-term sequelae.

• Mechanical methods of prophylaxis should be considered for all patients with high bleeding risks.

Pneumatic compression devices increase venous outflow and/or Kollef conducted a literature search. His conclusion is that there is convincing evidence to suggest interventions

can be employed to prevent hospital-acquired pneumonia or ventilator-associated pneumonia.

The evidence-based interventions focus on the prevention of aerodigestive tract colonization (avoidance of unnecessary antibiotics and stress ulcer prophylaxis, use of sucralfate for stress ulcer prophylaxis, selective digestive decontamination, short-course parenteral prophylaxis in high-risk patients).

. The preventive practices with the strongest supportive evidence were sucralfate instead of H2-antagonists for stress ulcer prophylaxis, and

selective digestive tract decontamination After evaluation, the author recommends sucralfate rather than H2-antagonists in patients at low to moderate risk for gastrointestinal tract bleeding. Selective digestive tract decontamination is not recommended because routine use may increase antimicrobial resistance.

Assess the need for ongoing stress ulcer prophylaxis. Discontinuation of prophylaxis should be considered if the patient is extubated, if there is no significant gastrointestinal bleeding upon transfer out of the intensive care unit, traumatic brain or spinal cord injury does not exist, if the patient is receiving enteral feeds, if the patient is not on a high-dose of glucocorticoid therapy and/or is not on an outpatient medication of thromboembolism for a wide range of clinical conditions.

Specific venous thromboembolism prophylaxis recommendations for intensive care unit patients: Intensive care unit patients are at high risk for deep vein thrombosis and pulmonary embolism but also for bleeding, thrombocytopenia coagulopathy and renal impairment. During an intensive care unit stay, different types of thrombo prophylaxis might be appropriate at different times, including, at times, combined therapies of an anticoagulant medication (heparins or fondoparinux) and intermittent compression devices [10].

Guidelines for the prevention of ventilator-associated pneumonia

General measures

1.Education

• All acute hospitals should have a programme of ongoing education in infection prevention and control for all clinical staff caring for patients undergoing mechanical ventilation. This should include information on local epidemiology in addition to evidence-based strategies to prevent ventilator-associated pneumonia(VAP).

• Mandatory induction training for all clinical staff should incorporate training in infection prevention and control, including hand hygiene and the appropriate use of personal protective equipment.

2. Clinical guidelines and care protocols

• Clinical guidelines and care protocols for prevention of VAP should be developed and implemented in the critical care setting.

• Adherence to the guidelines and protocols should be monitored regularly to ensure compliance and to address any deficits identified.

3. Infection prevention and control practice

• Implementation of standard precautions should be the primary strategy for the prevention of transmission of infectious agents among patients and healthcare workers.

• Hand hygiene, in accordance with national hand hygiene guidelines, should be part of the routine clinical care of mechanically ventilated patients. Hands should be decontaminated appropriately with soap and water or alcohol hand rub before and after every episode of direct patient contact, after any activity that potentially results in hands becoming contaminated and after removal of gloves.

• Adherence to hand hygiene should be monitored regularly to ensure compliance and results regularly fed back to healthcare staff.

• Personal protective equipment (e.g., gloves, aprons, face masks, goggles) should be worn appropriately and disposed of correctly in the appropriate healthcare waste stream.

• Transmission-based precautions (contact, droplet and airborne) should be used in addition to standard precautions when caring for patients who are known or suspected to be colonised or infected with organisms which can be transmitted via direct or indirect contact, or by droplet and airborne routes.

• The critical care environment should be cleaned regularly to reduce the possibility of transmission of organisms from the environment to the patient. Increased frequency of cleaning should be implemented in the event of an outbreak of infection where environmental contamination may contribute to the spread of infection.

• All hospitals should have in place *Legionella* control strategies, in accordance with national guidance.

4. Critical care environment

• Single patient rooms in newly-built or renovated critical care areas should have a minimum floor area of 26m² (not including ensuite sanitary facilities, if present). The design of new critical care units should take account of UK Health Building Note (HBN) 57 or equivalent international guidance documents.

• At least one airborne isolation room should be provided in newly-built critical care areas. The design of airborne isolation rooms should take account of UK Health Building Note (HBN) 4 Supplement 1 or equivalent international guidance documents.

• There should be a minimum of one clinical hand wash sink per 1-3 beds in open plan critical care areas and all single rooms should have a clinical hand wash sink close to the exit. Clinical hand wash sinks should be designed in accordance with UK Health Technical Memorandum (HTM) .

• Alcohol hand rub should be available at each bed space in critical care areas.

• Aspergillus control measures should be implemented in association with construction or renovation activities, in accordance with national guidance.

5. Staffing

• Adequate levels of suitably qualified nursing and medical staff should be provided in critical care areas.

6. Intubation

• Orotracheal intubation should be performed in preference to naso tracheal intubation, whenever possible.

• Avoid unplanned tracheal extubation and subsequent re intubation, whenever possible.

7. Positive pressure ventilation

• Non-invasive ventilation should be used, whenever possible.

• Mechanical ventilation should not be continued unnecessarily.

• Evidence based weaning protocols which incorporate daily assessment of readiness to wean and daily interruptions of sedation, as appropriate, should be in place.

8. Pharmacological strategies

• A restrictive red cell transfusion policy should be used in mechanically ventilated patients.

• No recommendation is made regarding the use of probiotics for prevention of VAP.

B- Prevention of aspiration

• An appropriately inflated cuffed endotracheal or tracheostomy tube should be used in patients who require mechanical ventilation and are at high risk of aspiration.

• The cuff inflation pressure should be adjusted until there is no audible air leak while using normal inspiratory airway pressures. An endotracheal cuff pressure of at least 20cm H2O should be maintained.

• I n patients with a tracheostomy requiring prolonged ventilatory support, cuff deflation should be

considered when the patient is alert, has normal swallowing and is tolerating trials of spontaneous

breathing.

• Aspiration of subglottic secretions should be considered in patients who are expected to be mechanically ventilated for more than 48 hours.

• Mechanically ventilated patients should be nursed in the semi-recumbent position (elevation of the head of the bed to(30-45), unless contraindicated.

• The use of rotating beds may be considered in mechanically ventilated patients who cannot tolerate the semi-recumbent position.

• Gastric distension should be avoided in mechanically ventilated patients who are being fed enterally.

C. Prevention of contamination of equipment

• Items designated for 'single-use' must never be reused.

• All equipment involved in patient care should be cleaned, decontaminated and stored in accordance with local hospital policy and the manufacturer's instructions.

• Sterile water should be used to rinse reusable non invasive respiratory equipment.

• Nebulisers and resuscitation equipment should be single patient use only.

• Healthcare workers should use facial protection when disconnecting closed breathing circuits.

• The ventilator circuit should be changed only if soiled or damaged; scheduled changes of the circuit are not recommended. New ventilator circuit tubing should be provided for each patient.

• Condensate accumulating within the ventilator circuit may be contaminated and should be drained and disposed of carefully. The circuit should be managed so that condensate does not drain towards the patient.

• Humidifier systems (heated humidifier or heat-moisture exchangers) should be changed as clinically indicated and in accordance with the manufacturer's guidance. A new humidifier system should be provided for each patient. Aseptic technique must be used when filling the humidifier. Water use for humidification must be sterile or distilled. No recommendation is made for the type of humidifier equipment used.

• The type of endotracheal suctioning system has no effect on the incidence of VAP. The use of closed systems is recommended in patients with copious tracheal secretions, and those suspected or known to be infected with organisms that are transmitted via the airborne route.

• Endotracheal suctioning systems should be changed only if soiled or damaged; scheduled changes of the system are not recommended. A new suctioning system should be provided for each patient.

D. Prevention of colonisation of the aerodigestive tract

• Histamine (2) receptor antagonists or proton pump inhibitors should be used in mechanically ventilated patients at high risk of developing upper gastrointestinal bleeding. Sucralfate may be considered in patients at low to moderate risk of bleeding.

• Regular oral hygiene should be carried out in all mechanically ventilated patients. A soft toothbrush should be used to clean the oral mucosa at least 12-hourly, except where contraindicated (e.g., increased risk of bleeding, thrombocytopenia).

• The topical application of chlorhexidine gluconate (0.12% - 2%) should be considered in such an oral care programme. Povidone-iodine (10%) may be considered for use in patients with severe head injury.

• No recommendation is made for selective decontamination of the digestive tract.

E. Implementation of VAP care bundle

• A VAP care bundle should be implemented in all critical care areas caring for mechanically ventilated patients.

F. Surveillance of ventilator-associated pneumonia

• Surveillance of VAP should be carried out in all critical care units caring for mechanically ventilated patients.

• Healthcare managers must support surveillance activities, including VAP surveillance.

• A local multidisciplinary steering committee should be established with relevant representatives including intensivists, ICU nursing, ICU audit, microbiology, infectious diseases, infection prevention and control, surveillance staff and healthcare facility management. This committee should lead the surveillance project, encourage compliance, circulate the results of surveillance data and monitor the effectiveness of preventative programmers.

• Where critical care information systems are in place, they should be used as much as is possible to collect VAP surveillance data.

• VAP rates should be fed back to the ICU staff and healthcare facility management on a regular basis; ideally monthly, but at least quarterly.

G. Implementation of recommendations

• Prevention of healthcare-associated infection, including VAP, should be prioritized by the Department of Health and Children, the Health Service Executive and all healthcare staff.

• Ring-fenced funding may be required to assist healthcare facilities to implement these recommendations, in particular to fill gaps in surveillance infrastructure (e.g., IT personnel, surveillance coordinators and administrative support).

• The following infrastructural requirements are recommended for the prevention of VAP: -

- Adequate levels of suitably qualified nursing and medical staff in all critical care areas caring for

mechanically ventilated patients

- An infection prevention and control programme adequately staffed and resourced to provide

appropriate education and training, assist with the implementation of measures to prevent VAP,

coordinate surveillance of VAP and conduct appropriate audit

- Information technology capable of collecting and calculating mechanical ventilator days as a

denominator for VAP rates

- Adequate laboratory support for timely processing of specimens and reporting of results.

Several evidence-based guidelines for the prevention of VAP have been published in recent years.

1. General preventative measures

The systematic application of educational interventions has been shown to decrease rates of health care associated infection (HCAI). Staff education programmes specifically addressing VAP have significantly reduced the incidence of VAP. Implementation of optimal infection prevention and control practices is crucial in the prevention of HCAI. Improved compliance with hand hygiene is associated with a reduction in rates of HCAI. Although there is little good quality evidence upon which to base guidance related to the maintenance of environmental hygiene, a body of clinical evidence

suggests an association between poor environmental hygiene and the transmission of organism.

A randomized trial comparing orotracheal and nasotracheal intubation found a trend towards a reduction in VAP using the orotracheal route. Subsequent studies demonstrated a higher incidence of sinusitis in patients who had been intubated via the nasotracheal route and that the incidence of VAP was lower in patients who did not develop sinusitis.

Re-intubation is associated with an increased risk of VAP; therefore, unplanned extubation should be avoided where possible.

The use of weaning protocols and the regular assessment of sedation requirements are effective in reducing the duration of mechanical ventilation and the incidence of VAP.

A lower mortality rate was demonstrated in critical care patients randomized to a restrictive red cell transfusion policy compared to those receiving liberal transfusions. Transfusion of blood products is associated with an increased incidence of VAP so unnecessary transfusion of packed red blood cells should be avoided.

2. Prevention of aspiration

Aspiration of oropharyngeal secretions into the bronchial tree is a major factor in the development of VAP therefore, strategies to prevent aspiration are important in the prevention of VAP.

Semi-recumbent positioning of the patient has been shown to be associated with less aspiration into the lower airway and a lower incidence of VAP than supine positioning. A subsequent randomized study in which no treatment

effect was observed found that the targeted semi-recumbent position of 45 was not achieved consistently.

The pressure of the endotracheal tube cuff should be sufficiently high to minimize the leakage of bacterial pathogens around the cuff into the lower respiratory tract. Failure to maintain an adequate cuff pressure (i.e., greater than 20cm H2O) was found to be an independent risk factor for the development of VAP.

Mechanically ventilated patients receiving enteral feeding may have substantial gastric volume, which can predispose them to gastro esophageal reflux, aspiration and VAP. The rate and volume of enteral feeding should be adjusted to avoid gastric distension and so reduce the risk of aspiration. Oro pharyngeal secretions can accumulate above the endotracheal cuff and contribute to the risk of aspiration. A meta-analysis found that establishing subglottic drainage of oro pharyngeal secretions using a specialized endotracheal tube was effective in reducing early-onset VAP in patients expected to be ventilated for more than 72 hours. Prolonged immobilization in mechanically ventilated patients may lead to atelectasis and impaired clearance of bronco pulmonary secretions, thereby potentially increasing the risk for VAP .

3. Prevention of contamination of equipment

A systematic review found that changing the ventilator circuit every 24 hours did not reduce the risk of VAP.

Circuits were changed if they were soiled or damaged. The maximum length of time between ventilator tubing changes has not been established. Three systematic reviews comparing open and closed endotracheal suctioning systems found no difference in the incidence of VAP .Although there is no evidence to support the use of closed suctioning for the prevention of VAP,

it may be of value in reducing the exposure of healthcare workers to aerosolized respiratory secretions

5. Prevention of colonization of the aero digestive tract Gastric colonization by potentially pathogenic organisms increases with lower gastric acidity. Medications that alter the gastric pH may increase the number of organisms present and so increase the risk for VAP. Stress ulcer prophylaxis with any agent is associated with an increased risk of VAP.

A systematic review that considered seven meta-analyses found that four of these reported a significantly decreased incidence of VAP with sucralfate compared with histamine (2) receptor antagonists, and that the other three found similar, but non-significant, trends in reduction of rates of VAP in patients treated with sucralfate. However, sucralfate is associated with a significantly higher risk of clinically important gastrointestinal bleeding in mechanically ventilated patients compared with histamine (2) receptor antagonists.

Few studies have addressed the risk of VAP associated with proton pump inhibitors; one small randomized trial found a significantly higher risk of clinically important gastrointestinal bleeding with ranitidine compared to omeprazole, and no significant difference in the incidence of VAP.

Poor oral hygiene in mechanically ventilated patients can lead to bacterial colonisation of the oropharynx. There is a strong correlation between the bacteria colonising the oropharynx and those causing VAP.

Provision of a single oral care procedure was shown to reduce the numbers of potentially pathogenic bacteria in the oral cavity. The use of toothbrushes has been found to be superior in plaque removal compared to the use of

sponge sticks. Delivery of oral care (tooth brushing and povidone-iodine solution) to mechanically ventilated patients was associated with a significant decrease in the incidence of VAP when compared to patients who received no oral care.

The use of topical chlorhexidine to prevent VAP has been studied. Two meta-analyses have been reported. The first found the topical application of chlorhexidine to be beneficial in preventing

of whether or not they had received the decontamination regimens. The prevalence of resistant organisms was significantly higher after periods of SDD and SOD .Therefore, no recommendation is made regarding the use of selective decontamination in prevention of VAP in Ireland.

6. Implementation of VAP care bundle

A care bundle is a collection of interventions (usually three to five) that are applied to the management of a particular condition. All the individual elements of a bundle are evidence-based practices, which benefit patient care; however, when applied together they result in significantly better outcomes than when implemented individually. In routine clinical practice, individual elements of a care bundle may not always all be done in the same way, leading to variation in the delivery of patient care. The aim of the care bundle is to tie them together into a cohesive unit that should be performed for every patient. All the tasks are necessary and must all occur in a specified period and place. The systematic implementation of VAP care bundles in the intensive care unit has been shown to reduce the incidence of VA [11].

Methodology

1-The Study Design

This descriptive study was carried out Omdurman Military Hospital in Khartoum.

2- The Study Area
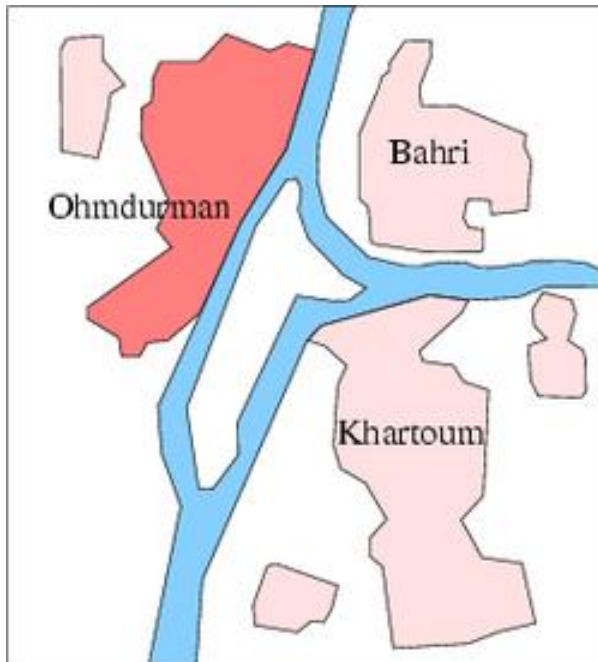
The study was conducted in Omdurman Military Hospital, capital of Sudan. **Omdurman** (standard <u>Arabic</u>**Umm Durmān**أم درمان) is the largest city in <u>Sudan</u> and <u>Khartoum State</u>, lying on the western banks of the <u>River Nile</u>, opposite the capital, <u>Khartoum</u>. Omdurman has a population of 2,395,159 (2008) and is the national center of commerce with Khartoum and <u>Khartoum North</u>. Furthermore, being a highly dense city, small private clinics that are scattered throughout the city are a common sight, especially close to *Hay Alshohada*. Some notable hospitals include:

* Omdurman Teaching Hospital, the biggest public hospital with an emergency center.

* Omdurman Military Hospital (*AlsilahAltiby*)

* Omdurman Maternity Hospital (*Aldayat Hospital*), a public hospital specializing in labor,

* Blue Nile Hospital, a private hospital

* Asia Hospital, a private hospital

* [[*Atigany Almahy* Hospital]], a public historical hospital specializing in psychological and mental health

3-Department of Omdurman Military Hospital:

Omdurman Military Hospital contains (trauma room. hot area, cold area. outpatient clinic, dressing room, triage, medicine word, surgical words, VIP wards, intensive care unit, theater, laboratory, blood bank, pharmacy ,x-ray, CT–scan, 3ambulance, engineering, diet therapy, kitchen and management department.

4. Study Population

The sample of this study included All currently working nursing staff at Omdurman Military Hospital including(60) nurses

5 .Sample Size

Sample size consisted of (60) nurses

6.Data Collection tools

Data was collected using a well-structured questionnaire contains two forms demographic data and knowledge assessment and checklist for interviewing the respondents .The questionnaire contained information that covered the variables under study .

7.Data Processing and Analysis

The data were checked, verified and analyzed using the Statistical Packages for Social Sciences (SPSS)

8- scoring system

Majority of the questionnaire question contain 3 answer

 if the nurse answered 3 = good   2 = fair   1 = poor

By checklist 22- 29 = good   22-14 = fair   less than 14 = poor

10. Data Analysis

For the purposes of this study, the data were coded, processed and transferred to computer coding. The descriptive analytical method was adopted which includes percentage, means, frequency distribution, tables and figures. SPSS was applied to determine the relationship between the independent variables and dependent variables

9.Ethical Considerations

The researcher took permission from the hospital of the study with an official letter from the Faculty of Nursing Sciences to the director of the

hospital with the agreement of the target population, every individual observed once. Verbal consent from the interviewed persons was also taken after explaining the study and its objectives to them. Confidentiality was given consideration and the information is used for the research purpose only.

Result
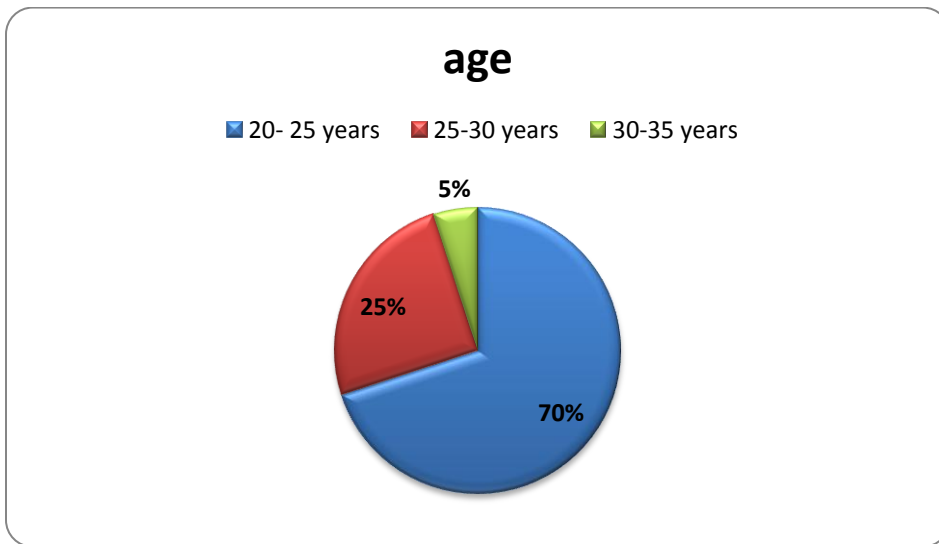
Figure NO (1) Distribution of study group according to their age (n=60)

Showed that 70% of nurses ranged between (20-25) , 25% ranged between (25-30) , 5% ranged between 30-35
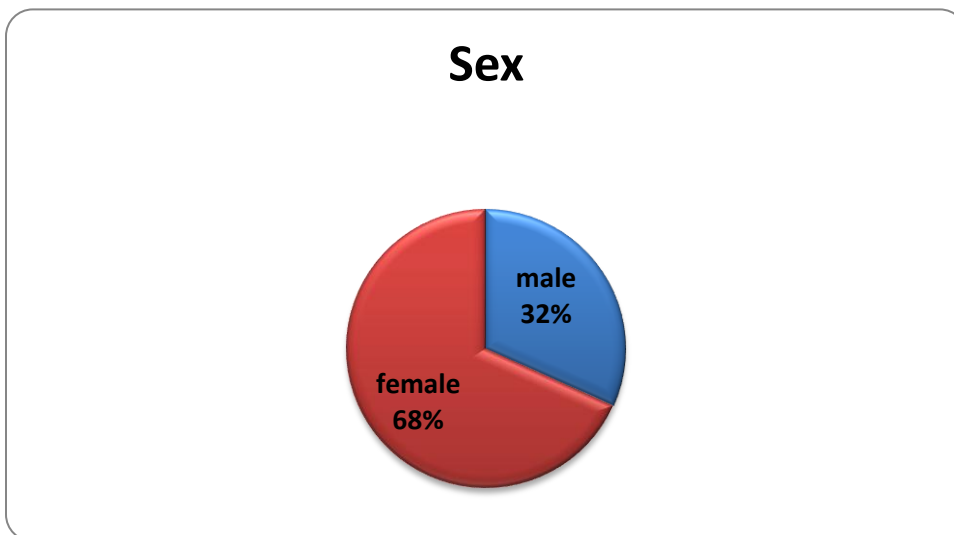
Figure NO (2) Distribution of study group according to their sex (n=60)

Showed that 68% of female and 32% of male .
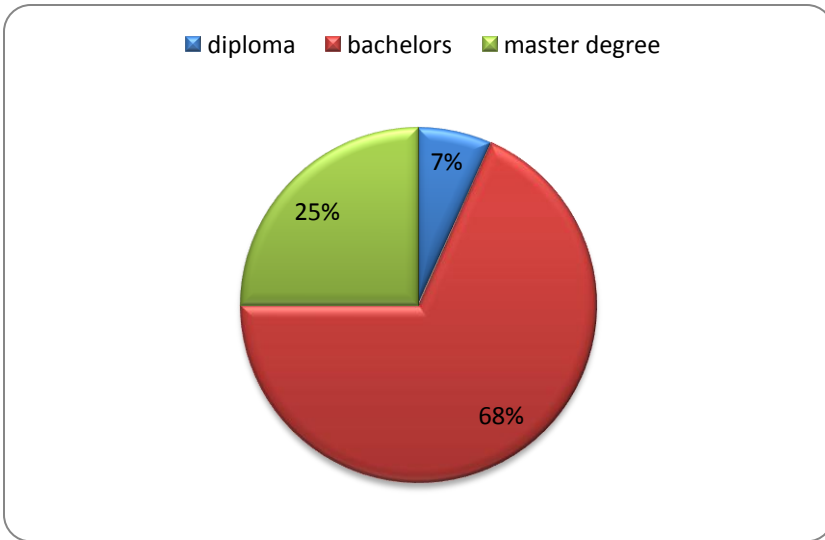
Figure NO (3) Distribution of study group according to their level of education (n=60)

Showed that 68% bachelors ,25% master degree , 7% diploma .
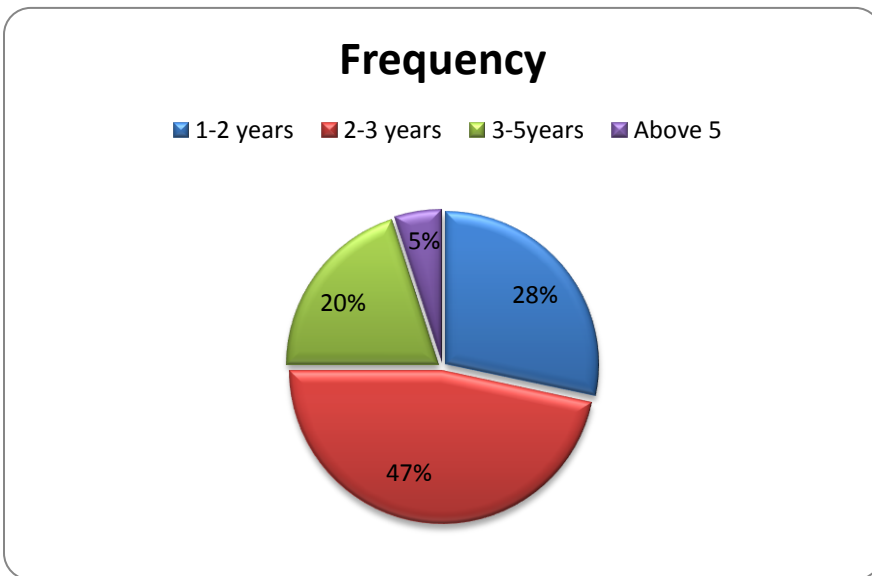
Figure NO (4) Distribution of study group according to their experience of the work (n=60)

Showed that 47% of nurses between 2-3years , 28% of nurses between 1-2years ,20% of nurses between 3-5 years , 5% of nurses above 5 years .

Table NO (1) Distribution of study group according to their knowledge about definition of VAP (n=60)

Phrase	Frequency	Percent
good	30	50.0%
fair	22	36.7%
poor	8	13.3%
Total	**60**	**100.0%**

Showed that 50% of study group had good knowledge , 36.7%had fair knowledge , 13.3% had poor knowledge.

Table NO (2) Distribution of study group according to their knowledge about risk factors (n=60)

Phrase	Frequency	Percent
Good	22	36.7%
Fair	29	48.3%
Poor	9	15.0%
Total	*60*	*100.0%*

Showed that 48.3% of nurses had fair knowledge , 36.7% had good knowledge , 15% had poor knowledge .

Table NO (3) Distribution of study group according to their knowledge about sign and symptoms (n=60)

Phrase	Frequency	Percent
Good	14	23.3%
Fair	28	46.7%
Poor	18	30.0%
Total	60	100.0%

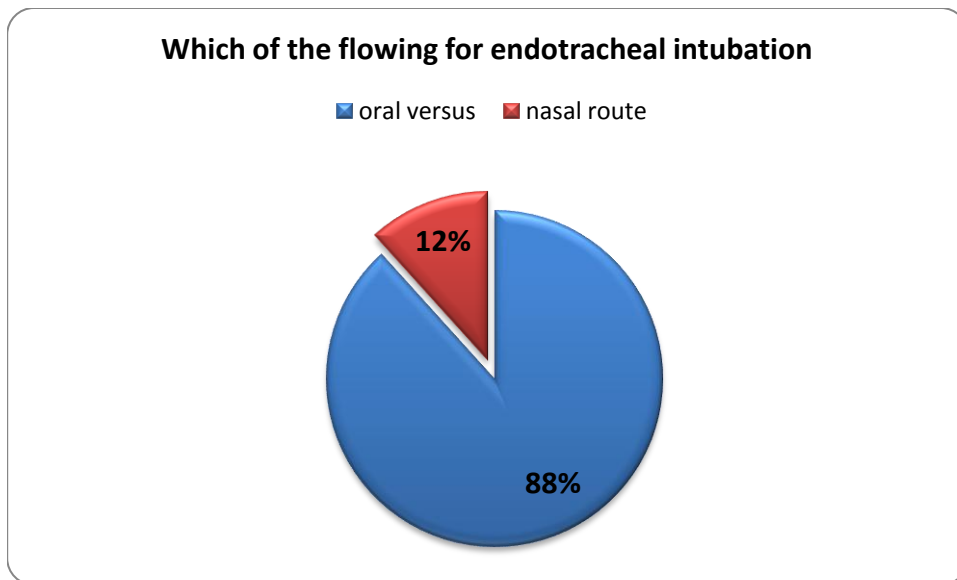Showed that 23.3% of study group had good knowledge ,46.7% had fair knowledge 30% had poor knowedge .

Figure NO (5) Distribution of study group according to their knowledge about routes of endotracheal intubation (n=60)

Showed that 88% of study group used oral versus , 12% of nurses used nasal route.

Table NO (4) Distribution of study group according to their knowledge about frequency of ventilator circuits changes (n=60)

Phrase	Frequency	Percent
every new patient	42	70.0%
every week	4	6.6%
every day	14	23.3%
Total	60	100.0

Showed that 70% of nurses change every new patient ,6.6% change every week , 23.3% every day .

Table NO (5) Distribution of study group according to their knowledge about type of airway humidifier (n=60)

Phrase	Frequency	Percent
Good	12	20.0%
Fair	15	25.0%
Poor	33	55.0%
Total	60	100.0

Showed that 20% of nurses had good knowledge , 25% of nurses had fair knowledge ,55% of nurses had poor knowledge.
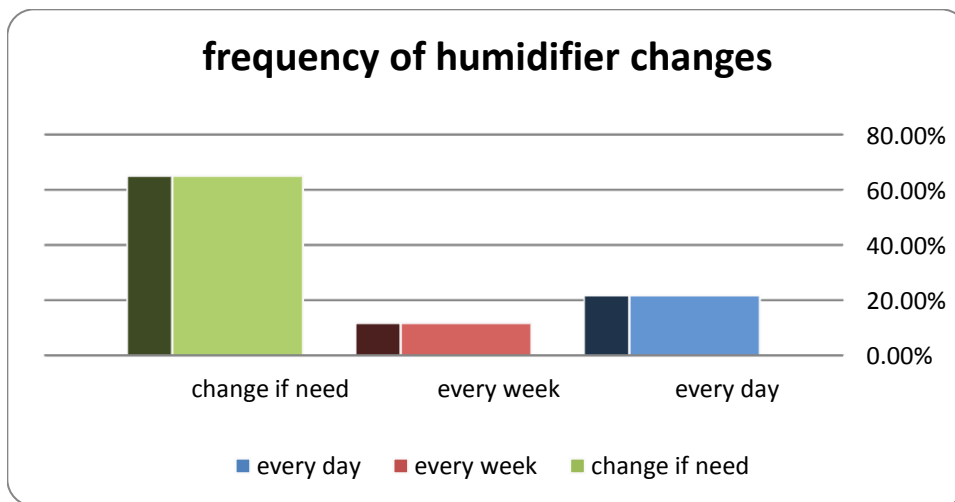
frequency of humidifier changes

Figure NO(6) Distribution of study group according to their knowledge about frequency of humidifier changes (n=60)

Showed that 21.7% of nurses had good knowledge , 11.7 % had fair knowledge , 65% had poor knowledge .
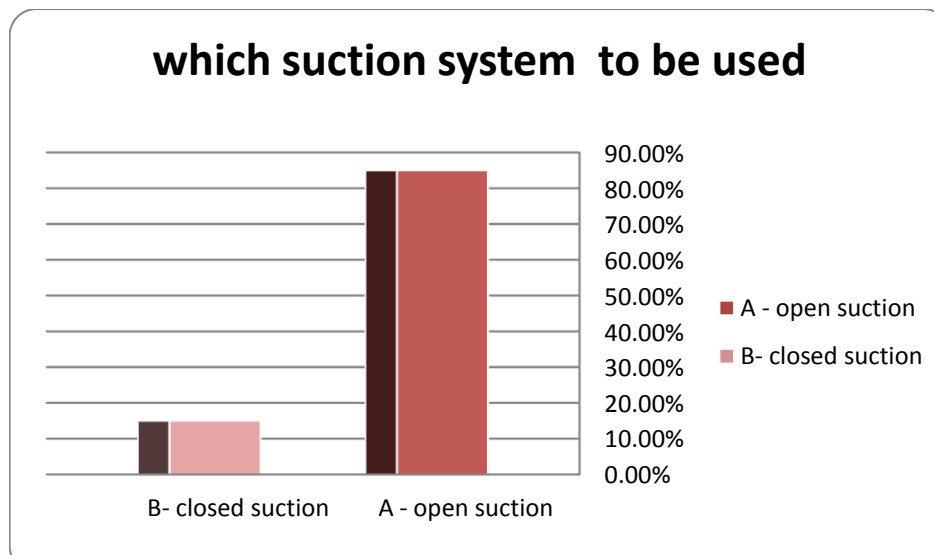

which suction system to be used

Figure NO (7) Distribution of study group according to their knowledge about type of suction system (n=60)

Showed that 85% of nurses used open suction , 15% used closed .

Table NO (6) Distribution of study group according to their knowledge about frequency of closed –circuit system changes (n=60)

Phrase		Frequency	Percent
	Good	19	31.7%
	Fair	10	16.7%
	Poor	31	51.7%
	Total	**60**	**100.0%**

Figure NO (12) Distribution of study group according to their knowledge

about type of suction system

Showed   that 31.7% of nurses had good knowledge , 16.7% had fair knowledge , 51.7% had poor knowledge.

Table NO (7) Distribution of study group according to their knowledge about types of endotracheal tubes (n=60)

Phrase	Frequency	Percent
Good	8	13.3%
Fair	49	81.7%
Poor	3	5.0%
Total	**60**	**100.0%**

Showed that 13.3% of nurses had good knowledge , 81.7% had fair knowledge , 5% had poor knowledge .
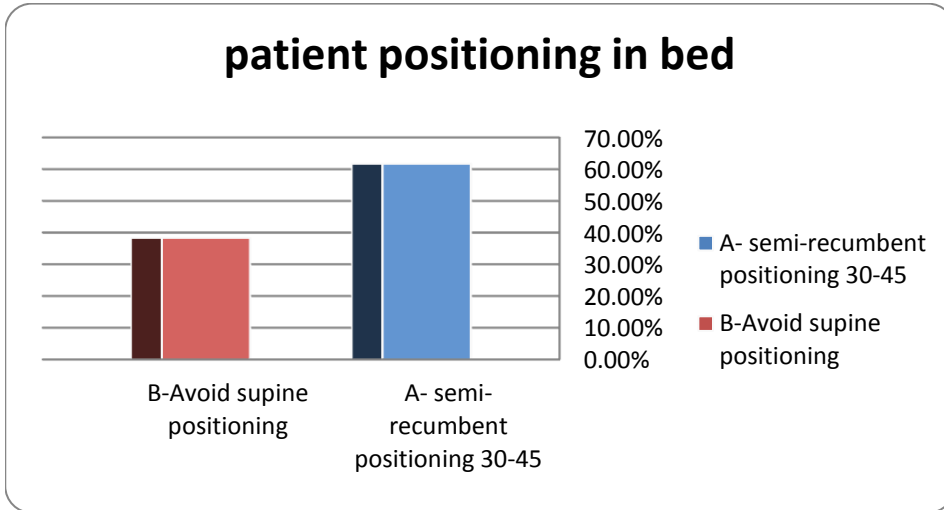
patient positioning in bed

Figure NO (8) Distribution of study group according to their knowledge about patient positioning in bed (n=60)

Showed that 61.7% of nurses had knowledge of positioning 30-45 , 38.3% knowledge of avoid supine positioning.

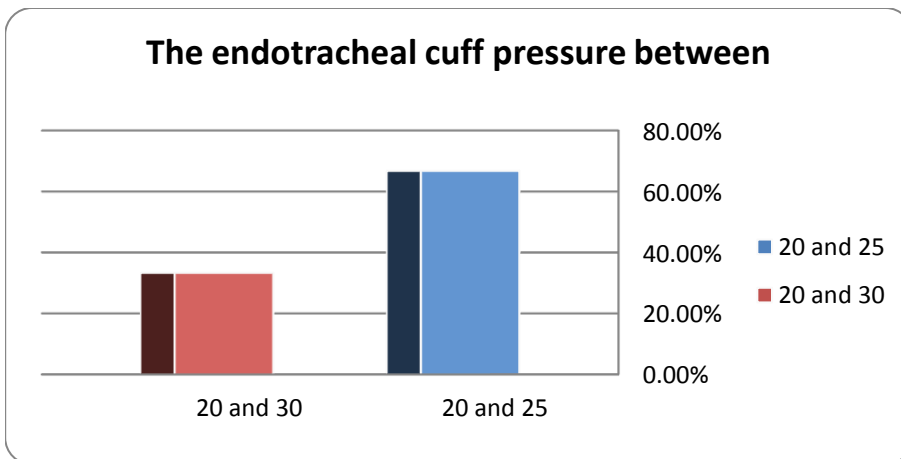**The endotracheal cuff pressure between**

Figure NO (9) Distribution of study group according to their knowledge about endotracheal cuff pressure (n=60)

Showed that 66.7% of nurses had knowledge between 20-25 , 33.3% had knowledge between 20-30

Table NO (8) Distribution of study group according to their knowledge about frequency of suction tube change (n=60)

Phrase	Frequency	Percent
Good	11	18.3%
Fair	17	28.3%
Poor	32	53.3%
Total	**60**	**100.0%**

Showed that 18.3% of nurses had good knowledge , 28.3% had fair knowledge ,53.3% had poor knowledge .

Figure NO (10) Distribution of study group according to their knowledge about solution is recommended for oral care

Showed that 55% of nurses used normal saline , 45 % used chlorhexidine

Table NO (9) Distribution of study group according to their knowledge about frequency of oral care (n=60)

Phrase	Frequency	Percent
Good	33	55.0%
Fair	14	23.3%
Poor	13	21.7%
Total	**60**	**100.0%**

Showed that 55% of nurses had good knowledge , 23.3% had fair knowledge , 21.7% had poor knowledge .

Table NO (10) Distribution of study group according to their knowledge about solution is recommended for suction (n=60)

Phrase	Frequency	Percent
Good	35	58.3%
Fair	4	6.7%
Poor	21	35.0%
Total	**60**	**100.0%**

Showed that 58.3% of nurses had good knowledge ,6.7% had fair knowledge , 35% had poor knowledge .
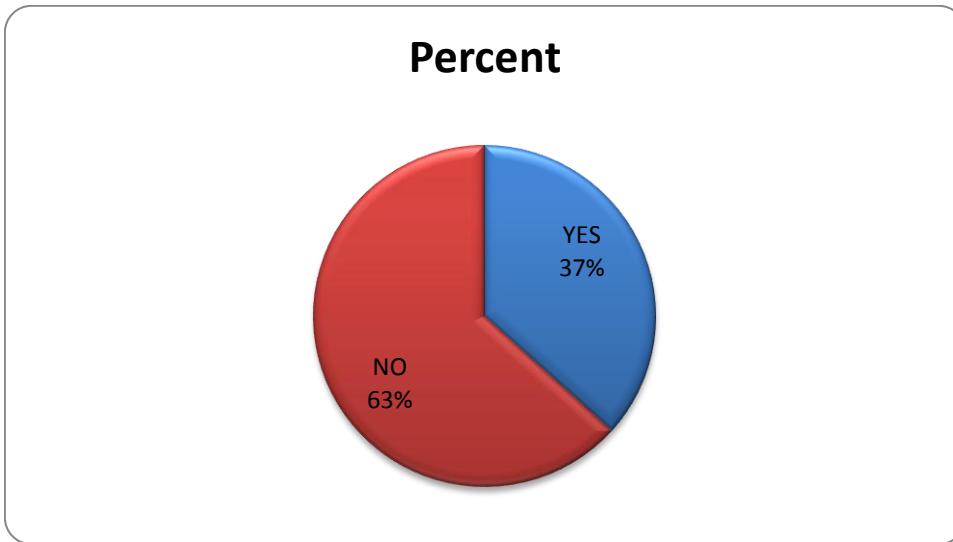
Figure NO (11) Distribution of study group according to their knowledge about continuous update of evidence based or work shop about prevention of VAP (n=60)

Showed that 37% of nurses NO update , 63% YES update .

Table NO (11) correlation between nurses knowledge about prevention of VAP and level of education

Knowledge	Level of education P value
Definition of VAP	0.534
Sign and symptoms of VAP	0.197
Types of air way humidifier	0.071

P value (0.05)

Showed that not significant relation between knowledge of Definition of VAP ,Sign and symptoms of VAP , types of air way humidifier and level of education .

Discussion

The ventilator associated pneumonia is one of the major causes for the mortality rate, increased length of stay in the hospital and high cost of treatment among ICU patients. ICU nurses can impart high quality care for the patients if they have an increased Knowledge and performance about prevention of VAP. Aseptic techniques performed by the ICU nurses can reduce the mortality rate and decreased length of hospital stay.

This study is a descriptive – analytic study was conducted to assess the knowledge and Performance of ICU nurses regarding the prevention of VAP in Omdurman military hospital .The researcher went through the result and elected the following facts and information , Good general knowledge about prevention of VAP and how to follow practices in the intensive care unit.

The age of the studied group ranged between 20-35 years the study showed majority (70%) of nurses their age ranged between 20- 25 years According to the study (68.3%) of study population were female . (68.3%) of nurses had bachelors . and less than half (46.7%) level of experiences between 2-3 years .

Regarding knowledge about definition of VAP (50%) had good knowledge , According to study population about risk factor more than one third (36.7%) , .Regarding knowledge about sign and symptoms of VAP (30%) had poor knowledge

Regarding knowledge about type of airway humidifier (55%) had poor knowledge ,The study showed two third (65%) of nurses change

humidifier if need . and The most of nurses (85%)used open suction ,Regarding knowledge about types of endotracheal tubes (81%) had fair knowledge .

Regarding knowledge about patient positioning (61.7%) of nurses put patient in semi recumbent position. The study showed more than half of nurses (53.3) had poor knowledge about frequency of suction tube change .

The study showed of nurses (55.%) had good knowledge about frequency of oral care and .

Regarding knowledge about solution uses for oral care (55%) of nurses used normal saline. The most of nurses (88.3%) used oral route for endotracheal intubation .

The study showed more than half (51.7%) had poor knowledge about frequency of closed –circuits suction system change and .Regarding update of evidence based or work shop about prevention of VAP (63.3%) NO update and (36.7%) YES update

According to the performance about prevention of VAP (60%) of nurses had poor performance, and less than quarter (23.3%) had fair performance , (16%) had good performance .The study showed about performance all of nurses don't wash of hands when contact with patients.

The study Showed that not significant relation between knowledge of Definition of VAP ,Sign and symptoms of VAP , types of air way humidifier and level of education .

Conclusion

This study is concluded the nurses had good knowledge about definition of VAP , and had poor knowledge about signs and symptoms of VAP , poor knowledge about types of air way humidifier And the nurses had poor performance.

Prevention of VAP knowledge and performance of ICU nursing staff could be improved by providing well-organized practical training.

Recommendation

1-Establish ventilator-associated pneumonia (VAP) quality improvement team in intensive care units and develop a protocol for prevention of VAP.

2- Establish adequate professional manpower to facilitate quality care for the ventilated patient.

3- Integrate VAP prevention program to staff orientation and refreshment program in ICU.

4- Provide adequate coaching and supervision to staff on intubation and care of ventilated patients until they are competent to work independently.

5- Educate acute care doctors and nurses on non-invasive ventilator strategies.
 Feedback unit VAP rates to the staff on regular basis to increase their awareness

6-Apply appropriate infection precautions to prevent patients from exposure to potential nosocomial pathogens.

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بسم الله الرحمن الرحيم

University of *shundi*

Faculty of post graduate studies and scientific research

Qutionnaier about **nurses knowledge regarding prevention of Ventilator associated pneumonia** in ICU:-

1-Age:-

 A\ 20- 25 years (   )   B\ 25-30 years (   )   C\ 30-35 years (   )   D\ above 35 years (   )

2- sex :-

A\ Male ( )   B\ Female( )

3-Level of education:-

A\ diploma (   )   B\ Bachelors(   )   C\ master degree (   )

4-Experence of the work:-

A\ 1-2 years (   )   B\ 2-3 years (   )   C\ 3 -5years (   )   D\ Above 5 (   )

5- ventilator associated pneumonia is :-

A\ a pneumonia that occurs in a patient who was intubated and ventilated at the time of or within 48 hours before the onset of event. (

B\ the most common infection acquired by patients in the intensive care unit.(   )

C\ the most common of all nosocomial infections which contribute to death. (   )

 D\ as a lung parenchymal infection occurring in a patient who has been assisted by invasive MV within the past 48 hours.( )

6- Risk factor of ventilator associated pneumonia:-

A \ age of 65 or more ( )

B \ underlying chronic illness (e.g. Chronic Obstructive Pulmonary Disease (COPD), emphysema, asthma ( )

C\ immunosuppression (   )

D\ previous pneumonia or remote infection (   )

7\ Signs and symptoms of ventilator associated pneumonia:-

A\ onset of purulent sputum   (   )

B\ Fever greater than 38.5°C (101°F) (   )

C \ Leukocytosis   (   )

D\ Positive sputum or blood cultures (   )

8\Which of the flowing for endotracheal intubation :-

A\oral versus ( )   B\ nasal route (   )

9- frequency of ventilator circuits changes:-

A\ every new patient (   )   B\ every week   (   )   C\every day ( )

10-Types of airway humidifier :-

A\ heat(   )   B\ moisture(   )   C\heat moisture (   )

11- frequency of humidifier changes:-

A\ every day(　)　　　　　　　B\every week(　)　　C\ change if need (　|)

12-type of suction system to be used :-

A\ open suction (　)　　　　B\ closed suction (　)

13- frequency of closed-circuit suction systems changes :-

A\ every new patient (　)　　　　　　B\ weekly change　(　)　　　C\ daily change　(　)

14- types of endotracheal tubes :-

A\ETTs with extra lumen (　)　　B\ ETTs with cuff　(　)　　C\ ETTs without cuff(　)

15-patient positioning in bed :-

A\ semi-recumbent positioning 30-45　(　)　　　　　　c\ avoid supine positioning (　)

16\The endotracheal cuff pressure between:-

A\20 and 25 (　)　　B\ 20 and 30(　)

17- Frequency of suction tube change:-

A\every perform suction　(　)　　　B\ every shift change　(　)　　　　C\ every day change　(　)

18-which solution is recommended for oral care :-

A\ Chlorhexidine   (   )   B\ normal saline   (   )

19- Frequency of oral care :-

A\ Once per day (   )   B\ At least once per shift (   )   C\ Following suction (   )

20\ which solution is recommended for suction :-

A\ Normal saline (   )   B\ Distilled water (   )   C\ Sterile water

21-are you on continuous update of evidence based or work shop about prevention of VAP in ICU .

A\ YES (   )   B\ NO (   )

Thank you

Nursing Checklist about prevention of ventilator associated pneumonia:-

Practices	done	Not done
Infection control measures		
1- wash hands before and after patient contact		
2- wash hands between patients		
3 -change gloves between patients		
4- Use sterile ambubag/ disinfect it before use		
5- Change ambubag between patients		
Patient positioning		
6- maintain continuously patient's position in (30o-45o) if not contraindicated visibly soiled		
Ventilator care measures		
7- drain and discard Periodically any condensate that collects in the tubing of a mechanical ventilator		
8- humidify respiratory circuit using humidity and heat exchange filter		
9- Replace humidifiers		
10- replace the ventilator circuit regularly		
11- Change a heat moisture exchanger that is used by a patient when it becomes		
End tracheal Suctioning care		

12- Maintain adequate pressure in endotracheal tube cuff		
13- Wear clean gloves with Closed suctioning		
14- Wear sterile gloves with an open suction system		
15- Using sterile technique when applying tracheal suctioning.		
16- Use sterile suction equipment		
17- Replacement of suction systems		
18- Replace suction tubes		
19- use Saline/ distilled water prior to suctioning		
20- replace the solution used for suction		
21-continuous aspiration of sub glottic secretions if ventilator more than 48 hours		
Oral care		
22- perform oral hygiene with antiseptic mouth wash		
2 3-use topical antimicrobial agents for oral decontamination regularly		
Peptic ulcer prophylaxis		
24- check the gastric residual volume (GRV) every 4 to 6 hours		
25- administer intermittent rather than continuous enteral feeding		
26-Perform Routine acidification of gastric feeding		
Extubation and Weaning trials		
27- interruption in sedation utilizing sedation scale		
28- Perform daily assessments of readiness to wean and extubate		
DVT prophylaxis 29- Apply anti-embolic stockings or sequential compression		