Epidemiology of Ventilator associated pneumonia in surgery Intensive care units of Ain Shams University Hospital

Thesis submitted for fulfilment of the MD degree of Epidemiology

By

Rasha Saad Hussein Abdallah

Assistant lecturer of Community, Environmental and Occupational Medicine

Faculty of Medicine- Ain Shams University

Under supervision of

Prof. Dr. / Aisha AboulFotouh Al- Gamal

Professor of Community, Environmental and Occupational Medicine
Faculty of Medicine- Ain Shams University.

Prof. Dr. / Samia Ismail Hassan El-Damaty

Professor of Community, Environmental and Occupational Medicine
Faculty of Medicine- Ain Shams University.

Prof. Dr. Ghada Abd El-Wahed Isamil

Professor of clinical pathology
Faculty of Medicine- Ain Shams University.

Dr. Sally Adel Hakim

Assistant professor of Community, Environmental and Occupational Medicine
Faculty of Medicine- Ain Shams University

Faculty of Medicinee
Ain Shams University
2016

Acknowledgments

Deep thanks to Gad for everything

I wish to express my thanks and deep gratitude to **Dr. Aisha abouelfotouh and Dr. Samia Eldamaty** professors of Community, Environmental and Occupational Medicine , faculty of Medicine Ain Shams University for their kind supervision and their expert advises that greatly enriched this work.

I am deeply grateful to **Dr. Ghada Ismail**, professor of Clinical Pathology, faculty of Medicine Ain Shams University for her keen and continuous support. Also, I wish to express my thanks to **Dr. Sally Adel Hakim** Assistant professor of Community, Environmental and Occupational Medicine, faculty of Medicine Ain Shams University for her encouragement and support. Alsodeep thanks to my colleagues **Wafaa Mohammed** assistant lecturer and **Ghada Ossama** lecturer of Community, Environmental and Occupational Medicine for their support.

Abstract

Background: Ventilator-associated pneumonia (VAP) is the most common intensive care unit acquired infection, and it is associated with increase in hospitalization, health care cost and mortality. It classified into early onset or late onset. **Objectives:** Measure the incidence rate and risk factors of VAP, measure the VAP impact on length of stay in ICU and duration ofmechanical ventilation and to measure adherence to IHI (Institute of Health Improvement) ventilator bundle. **Methodology**: A prospective study conducted at surgery hospital ICUs.All ventilated patients who didn't developed chest infections within 48h of mechanical ventilation are followed until discharge from ICU, sample size was 240 patients. **Results**: 56.2% of the study population weremales; the mean age was 43.2± 15.6. Incidence density was 38.3/1000 ventilator day. Early onset VAP was 47.5% and late onset VAP was 52.5%. The independent risk factors of VAP infection are duration of mechanical ventilation, smoking, chest diseases, insertion of IV cannula and Acute Physiological and Chronic Health Evaluation II Score (APACHE II) .Crude mortality rate was 42.1%. VAP infection have a significant impact in both the length of stay in ICU and duration of mechanical ventilation.VAP cases have lower adherence to all IHI ventilator bundle elements and the overall compliance was 71± 22.8 in VAP cases Vs 80.7± 16.0 in non VAP. Gram negative MDRs bacteria wasisolated in 84.3% of VAP cases and the commonest isolated bacteria was *Acintobacter* 33.9%.**Conclusion:** VAP is a serious ICU acquired infection with significant impact and required effective preventive action.

List of Contents

List of tables

List of Figures

List of abbreviations

AGNB	Aerobic gram negative bacteria
AIDS	Acquired Immune Deficiency Syndrome
APACHE	Acute Physiological and Chronic Health Evaluation Score
APIC	Association for professional in Infection control and Epidemiology
CAUTI	Catheter associated urinary Tract Infection
CDC	Centre for disease control and prevention
CI	Confidence Interval
CLABSI	Central Line Associated Blood Stream Infection
COPD	Chronic Obstructive Pulmonary Diseases
CPIS	Clinical Pulmonary Infection Score
DVT	Deep Venous Thrombosis
EMRO	Eastern Mediterranean region Organization
EPIC	European Prevalence study of Infections in ICU
GCS	Glasco Coma Scale
HCAP	Health care Acquired Pneumonia
HAI	Hospital Acquired Infection
HCW	Health Care Worker
HIV	Human Immune deficiency Virus
ICPs	Infection control personals
ICU	Intensive Care Unit
IHI	Institute of Health care Improvement
INICC	International Nasocomial Infection Control Consortium
LOS	Length of stay
MDRO	Multi-drug Resistance Organisms
MRSA	Methicllin Resistance Staphyloccousaureus
MV	Mechanical Ventilation
NHSH	National Health care Safety Network
NICU	Neonate Intensive Care Unit
NNIS	National Nasocomial Infection surveillance
OR	Odds Ratio
OTS	Operative theaters
PICU	Pediatric Intensive Care Unit
POA	Present On Admission
POC	Post Operative Care
PPMO	Potential pathogenic micro-Organism
PUD	Peptic Ulcer Disease
RICU	Respiratory intensive Care Unit
SOFA	Sequential Organ Failure Assessment score

SSI	Surgical Site Infection
UTI	Urinary Tract Infection
VAP	Ventilator associated Pneumonia
WHO	World Health Organization

Introduction

Health care-associated infections (HAI), or infections acquired in health-care settings are the most frequent adverse events in health-care delivery worldwide.

Hundreds of millions of patients are affected by health care-associated Infections worldwide each year, leading to significant mortality and financial losses for health systems **(WHO, 2013).**

Healthcare-associated infections are defined as infections not present and without evidence of incubation at the time of admission to a healthcare setting **(Coffin et al, 2008).**

Health care associated infections, is the fourth leading cause of disease in industrialized countries, (**Report of the European Science Foundation, 2005)**

Healthcare-associated infections are infections caused by a wide variety of common and unusual bacteria, fungi, and viruses during the course of receiving medical care. **(CDC, 2012).** They can be localized or systemic, can involve any system of the body, be associated with medical devices, or blood product transfusions. The three major sites of healthcare-associated infections are (bloodstream infection, pneumonia, and urinary tract infection) **(Coffin et al, 2008).**

Of every 100 hospitalized patients at any given time, 7 in developed and 10 in developing countries will acquire at least one health care-associated infection. The endemic burden of health care-associated infection is also significantly higher in low- and middle-income than in high-income countries, in particular in patients admitted to intensive care units and in neonates. **(WHO , 2013).**

In a study conducted at surgery hospital Ain Shams University the overall infection rate was 10% among the admitted patients **(Al Bagoury et al ,2010).**

In a multicenter study conducted in 71 adult ICUs the most frequent ICU acquired infection was ICU-acquired pneumonia (47%) followed by ICU-acquired bloodstream infection (37%) **(Malacarne et al, 2008).**

Ventilator-associated pneumonia (VAP) is the most common hospital acquired infection in the intensive care unit, and it is associated with prolonged hospitalization, increased health care costs, and high attributable mortality. **(Ioannis et al, 2009).**

VAP is defined by the Centre for Disease Control and Prevention (CDC) as pneumonia in persons who had a device to assist or control respiration continuously through a tracheotomy or by end tracheal intubation within the 48-hour Period before the onset of the infection **(Jason et al ,2006)**

It is commonly classified as either early onset (occurring within 96 hours of start of mechanical Ventilation) or late onset (occurring more than 96 hours after start of mechanical ventilation). **(Chastre and Fagon , 2002)**

VAP is a significant nosocomial infection affecting up to one third of Patients requiring mechanical ventilation, and is associated with significant attributable morbidity and mortality **(Jason et al, 2006).**

VAP primarily results from microbial invasion of the normally sterile lower respiratory tract due to micro aspiration of oral secretions. Infected biofilms on endotracheal tubes also play an important role in pathogenesis (**Adair CG et al, 1999).**

Risk factors for VAP could be classified into patient factors (such as immunsuppression) and treatment-related factors (such as intubation and enteral feeding) are Important contributors to the development of infections . (**Combes A, et al, 2002)**

Diagnosing VAP is difficult in ICU patients with multi-organ failure. In addition, differentiating lower respiratory tract infection from colonization can be a difficult task in patients requiring mechanical ventilation. Also, lack of a gold standard for the diagnosis is a major culprit of poor outcome of VAP (**Gandni et al 2010).**

Prevention strategies of VAP focus on the reduction of risk factors for oropharyngeal and gastric colonization and the subsequent aspiration of Pathogens **(Flanders SA et al ,2004).** A series of interventions related to ventilator care that, when implemented together, will achieve significantly better outcomes than when it implemented individually (Bundle). One of these bundles is **the institute of healthcare improvement (IHI) Ventilator Bundle.**

The key components of the IHI Ventilator Bundle are:

- Elevation of the Head of the Bed
- Daily "Sedation Vacations" and Assessment of Readiness to Extubate
- Peptic Ulcer Disease Prophylaxis
- Deep Venous Thrombosis Prophylaxis
- Daily Oral Care with Chlorhexidine

Applying IHI's ventilator bundle in the care of ventilated patients can markedly reduce the incidence of VAP an average 45% reduction in the incidence of VAP was observed in the ICUs that applied the IHI ventilator bundle **(Institute of healthcare improvement, 2011).**

Surveillance in public health is defined as ''the ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality and to improve health".

Surveillance for HAI is one of the major activities of the infection control program. Availability of accurate data is mandatory for prevention and control of different HAI including VAP and required for evaluation of patient safety and quality health care in health care setting (**CDC, 1992).**

The rational of this study is to reduce the impact of the VAP by understanding the epidemiology of VAP among the ICU admitted patients, and to identify the effect of preventive measures like Ventilator bundle on VAP rate.

Goal of the study

The goal of the study is the reduction of the ventilator-associated pneumonia.

Objectives

1. To estimate the incidence of the ventilator associated pneumonia among ventilated patients in general surgery intensive care units in Ain Shams University Hospitals.
2. To find out risk factors of ventilator associated pneumonia in the term of epidemiological and clinical risk factors among ventilated patients.
3. To calculate the effect of ventilator associated pneumonia in form of extra day in length of stay on mechanical ventilation and intensive care unit stay.
4. To assess the degree of compliance to ventilator bundle.