ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF ALLIED HEALTH SCIENCES
DEPARTMENT OF NURSING AND MIDWIFERY

ASSESMENT OF KNOWLEDGE AND PRACTICE OF NURSES WORKING IN THE ICU TOWARDS PREVENTION OF VENTILATOR ASSOCIATED PNUMONIA AT SELECTED GOVERNMENTAL HOSPITALS ADDIS ABABA, ETHIOPIA 2015/16.

BY: BEHAILU AFERU (BSCN. MSCN Candidate)

ADVISOR: TIGESTU G/YOHANNES (RN, BSN, MSCN)

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JANUARY, 2016
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A THESIS TO BE SUBMITTED TO SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF ALLIED HEALTH SCIENCES, DEPARTMENT OF NURSING AND MIDWIFERY FOR PARTIAL FULFILLMENT OF THE DEGREE OF MASTERS IN ADULT HEALTH NURSING

ADDIS ABABA, ETHIOPIA

JANUARY, 2016

DECLARATION

AND

COPY RIGHT

I Behailu Aferu , declare that this dissertation / thesis is my own original work and that it has been presented and will not be presented to any other university for a similar or any other degree award.

Signature .....

Date 28/04/16

APPROVED BY THE BOARD OF EXAMINERS

This thesis by **Behailu Aferu Filto** is accepted in its present form by the board of examiners as satisfying thesis requirement for the degree of Masters of Science in Adult Health Nursing.

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ACKNOWLEDGEMENT

I express my sincere gratitude and appreciation to my advisor **Ato Tigestu G/Yohannes** for his guidance and immeasurable support throughout this research.

To God for giving me the privilege of studying.

I extend my gratitude and thank you to the following people and institutions that made this study possible:

To **Ato Leoul Derbe** for his guidance and immeasurable support.

To my family who encouraged me when I thought I would never get finished. Their love and devotion will help me to finish my goal.

Special thanks to **Selamawit Molla** who has always been with me and encouraged me to fulfill my dreams.

To the five hospitals where this research conducted and the relevant personnel in these institutions.

To all nurses in the ICUs who participate in this study.

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ABSTRACT

Background: The professional practice in a high risk critical care setting requires knowledge, skills, clinical experience and problem-solving abilities to assess monitor and effectively respond to the needs of critically ill patients. In addition, little is known regarding knowledge of nurses' working in the intensive care, concerning prevention guidelines and its application during the provision of patient care in the ICU. The Gaps between knowledge and actual clinical practice have not been sufficiently studied and needs further research which will contribute to the quality of care and improvement of critical patient's outcome.

Objective: this study aims to assess the knowledge and practice of nurses working in the ICU towards prevention of VAP at selected Hospital Addis Ababa, Ethiopia, 2015.

Methods: Study was conducted in five randomly selected governmental hospitals at Addis Ababa, Ethiopia. Descriptive cross sectional study design were employed on all 117 nurses working in the ICU in respected hospitals. **Data Analysis** Descriptive and inferential statistics were utilized to analyze the data. Descriptive statistics included frequency, percentage, mean and standard deviation. Chi square test was utilized to determine association of selected variables. Data were analyzed using SPSS version 200.

Results: The current study revealed that, Most of the studied sample 60.7% had satisfactory level of knowledge and 53.3% had Good level of practice regarding VAP prevention measures with a total mean score of (15.97 ± 3.23) and (15.47$\pm$2.029) respectively. Significant association was found in knowledge between participants with different education level as found (p = 0.0.041), age groups (p = 0.008), sex of participant (p=0.023) and between participants with different years of ICU working experience (p< 0.001). No significant association was found regarding nurses' practice (p=>0.05) except sex was found (p-0.010).

Conclusion and recommendation: Most Nurses work in critical care unit of the five hospitals are knowledgeable and have good practical performance regarding prevention of VAP, However, significant number of nurses 39% and 47% lacked knowledge and practice respectively. So updating knowledge and practice of nurses through Education and training would help to improving the quality of nursing care and also keep nurse's knowledge and practice consistence.

Key Words: Knowledge, Practices, Intensive care unit

Acronyms

AAU- Addis Ababa University

AGNB-Aerobic Gram negative bacteria

BSC- Bachelor of Science

CAP-community-acquired Pneumonia

CAUTI-catheter-associated urinary tract infections

CDC-center of communicable disease control

CI –Confidence interval

CLABSI-central line–associated bloodstream infections

DRC-Departmental review committee

EBGs-evidence-based guidelines

ETB-Ethiopian Birr

FMOH– Federal Ministry of Health

HCAP-healthcare associated pneumonia

HCUs-high-care units

HDUs -high-density units

ICU= Intensive Care Unit

LTACH- long-term acute care hospital

MRSA-methicillin-resistant Staphylococcus aureus

MSC- Master of science

MV-mechanical ventilation

PI –Principal Investigator

SPSS-Statistical Package for the Social Sciences

SSI-surgical site infections

VAP-ventilator-associated pneumonia

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INTRODUCTION

1.1 Background

Hospital acquired infections (HAIs), defined as infections acquired during the patients' stay in hospitals, constitute a major worldwide public health problem despite advances in our understanding and control of these infections (1). Over 1.4 million people worldwide suffer from HAIs with 5- 10% of patients admitted to modern hospitals in the developed world acquiring one or more of these infections. The risk of HAI in developing countries is 2- 20 times higher than in developed countries (2).The magnitude of the problem in terms of expenditure and human suffering being enormous. Ventilator-associated pneumonia (VAP) is defined as pneumonia that occurs 48-72 hours or thereafter following endotracheal intubation, characterized by the presences of a new or progressive infiltrate, signs of systemic infection (fever, altered white blood cell count), changes in sputum characteristics, and detection of a causative agent (3).

The prevalence rates of VAP ranging from 10% to 70% in critical care units (4).nosocomial infections mostly VAP are more common complications of care provided in ICU.The ICU mortality rate of infected patients was 25%, two times more than that for non-infected patients in an international study (5).Hospital-acquired pneumonia (HAP) is a pulmonary infection that develops in patients hospitalized for more than 48 hours, either in the ICU or in other wards (6, 7). Ventilator-associated pneumonia (VAP), a subset of HAP that occurs in mechanically ventilated patients, is the most frequent ventilator-associated complications (6, 7). HAP/VAP represents a major cause of deaths, morbidity and resources utilization in hospitalized patients, most notably in those with severe underlying conditions, Although VAP is generally a severe illness, with the patient treated in the intensive care unit (ICU), non-intubated patients with HAP can have either mild or more severe pneumonia.(6, 8-12).

VAP is most common nosocomial infection in the intensive care unit (ICU) with an incidence ranging from 8 to 28% in intubated mechanically ventilated patients (13,14).It is the second most common nosocomial infection in the intensive care unit (ICU) and the most common in mechanically ventilated patients (15, 16).

1.2 Statement of the Problem

Patients in intensive care units (ICUs) are a significant subgroup of all hospitalized patients, accounting for about 25% of all hospital infections. The prevalence of ICU acquired infections is significantly higher in developing countries than in industrialized countries, varying between 4.4% and 88.9%. Furthermore, device associated infection rates in developing countries, especially ventilator associated pneumonia (VAP) followed by central venous catheter related bloodstream infections (CRBSIs), occur at a higher frequency than in European countries and USA (17–19). The major problems associated with increased nosocomial infections in these countries are low compliance of hand hygiene, excessive number of patients and workload, inadequate staff and personal protective equipment, and late establishment of infection control programs (20). Increasing drug resistance and the spreading of multi drug resistant (MDR) pathogens in the ICU environment, results in limited therapeutic options and prolonged hospitalization. Consequently, ICU acquired infections have been associated with significant morbidity, mortality and rising healthcare costs in developing countries with limited resources (21).

Perhaps the most concerning aspect of VAP is the high rate of associated mortality. Hospital mortality of ventilated patients who develop VAP is 46% compared to 32% for ventilated patients who do not develop VAP. The professional practice in a high risk critical care setting requires specialized knowledge, advanced skills, clinical experience and problem-solving abilities to assess monitor and effectively respond to the needs of critically ill patients. In addition, critical care nurses' knowledge of adherence to and practice toward evidence-based guidelines (EBGs) to prevent VAP has been inadequate. Gaps between knowledge and actual clinical practice have not been sufficiently studied and needs further research which will contribute to the quality of care and improvement of critical patient's outcome. Therefore it is important to evaluate intensive care nurse's knowledge and practice to highlight possible contributors and barriers to the implementation of preventive measure on prevention of ventilator associated pneumonia, which is what this study is aiming to achieve.

1.3 Significance of the study

Pneumonia rates are much higher in mechanically ventilated patients due to the artificial airway, which increases the opportunity for aspiration and colonization. VAP is the leading cause of nosocomial infection in the ICU. For critically ill and postoperative patients receiving mechanical ventilation, VAP is a significant cause of morbidity and mortality. Patients with VAP have significantly longer duration of mechanical ventilation and ICU stay.(22; 23.)

To ensure the highest standards of nursing care, nursing practice must be based on a strong body of scientific knowledge. This can be achieved through adherence to the evidence based guidelines for prevention of ventilator associated pneumonia, ultimately improving patient's outcomes. Improved outcomes will shorten patient's ICU length of stay, hospitalization as well as benefit the patient financially with decreased hospital costs. Hospitals also gain benefits as they are continually faced with the challenge of providing cost effective services to patients and communities. . As VAP is linked with higher morbidity, mortality and costs, preventing ventilated patients from developing VAP is an important patient safety objective. VAP is thought to be a common complication of the acute respiratory distress syndrome, and the significant burden of VAP justifies the implementation of specific preventive strategies.

This study is meant to contribute in creating awareness of the prevention and control of VAP among ICU nurses.

1.4 Research questions

1. What is the knowledge of nurses working in the intensive care unit about the prevention of VAP in ICU?
2. What is the practice of nurse working in the ICU about the prevention of VAP?

LITERATURE REVIEW

This chapter begins with providing an insight about pneumonia specially the ventilator associated pneumonia and its Incidence and consequences. Literature review on VAP will also be addressed.

Pneumonia is classified as community-acquired (CAP), healthcare-associated (HCAP), HAP, or VAP. VAP is a sub-classification of HAP, in hospitalized and mechanically ventilated patients. CAP is defined as pneumonia for which the first positive bacterial culture is obtained within 48 hours of admission to the hospital and the patient does not have risk factors for HAP. Risk factors that are associated with health care associated pneumonia involves: when admission source indicates a transfer from another healthcare facility; patient has received hemodialysis, wound, or infusion therapy as an outpatient; patient was previously hospitalized for at least 3 days within the past 90 days prior to current admission; or the patient is immune compromised due to underlying disease or therapy (HIV, chemotherapy) (24).

Pneumonia represents the host's inflammatory response to the microbial invasion of the normally sterile lung parenchyma. The magnitude of this response depends on the size and type of the inoculum, the virulence of the organisms involved, and the competence of the host's immune system.

Patients in intensive care units (ICUs) accounting for about 25% of all hospital infections. The prevalence of ICU-acquired infections is significantly higher in developing countries than in industrialized countries, varying between 4.4% and 88.9%. Furthermore, device-associated infection rates in developing countries, especially ventilator-associated pneumonia (VAP) followed by central venous catheter-related bloodstream infections (CRBSIs), occur at a higher frequency than in European countries and USA(25,26,27).The major problems associated with increased nosocomial infections in these countries are low compliance of hand hygiene, excessive number of patients and workload, inadequate staff and personal protective equipment's and late establishment of infection control programs(28).

A prospective observational cohort study done in Nepal of 69 patients who were mechanically ventilated for more than 48 hours were evaluated to find out the development of nosocomial pneumonia and presence or absence of risk factors. The result showed that Twenty two (31.88%) out of 69 patients developed ventilator associated pneumonia, majority of them between four days to 14 days. Re-intubation, invasive lines, H2 blockers and low PaO2/FiO2 were identified as major risk factors in the study. Enteral feeding via nasogastric tube and use of steroids was not associated with development of ventilator associated pneumonia. The patients with ventilator associated pneumonia had significantly longer duration of mechanical ventilation (18.88±7.7 days Vs 7.36±4.19 days) and stay (29±17.8 days vs 9.22±5.14 days). The morality was similar for both the groups with or without ventilator associated pneumonia (29).

Research conducted in the ICUs of Europe demonstrated that VAP was the most frequent cause of nosocomial infection (2.1% or 13.9 episodes/1000 days of mechanical ventilation (MV)(30) , especially in France, where the rate was 16, 9 episodes/1000 days of MV(31). In the United States of America, this was the second most common cause in 2006, reaching 27% of critical condition patients(32)and in Brazil, 18.8% of customers developed VAP (58.2 episodes/1000 days of MV)(33).

The rates of bed side infection (BSI) in neonates are 3-20 times higher in developing countries, and, in some countries, approximately half of the patients in neonatal ICUs acquire an infection, and case fatality rates may reach 52%. The rates of VAP vary from 10 to 41.7 per 1000 ventilator-days with increased ICU LOS (34)..

A study conducted in the United States of America in 2000, to assess tracheal colonization within 24 hours of intubation indicates that the pathogenesis of VAP usually requires two important processes that is, bacterial colonization of the aero-digestive tract and aspiration of contaminated secretions into the lower airway. The incidence of VAP was found to be 26 %, Andthe microorganisms involved were *Staphylococcusaureus*(44%),*Heamophilusinfluenzae*(31 %), *Streptococcus pneumonia* (12 %), and gram-negative bacilli (13 %). A multivariate logistic regression analysis showed that the tracheal colonization by *Staphylococcus aureus*, *Haemophilus influenza* or *Streptococcus pneumonia* within 24 hours of intubation was an independent risk factor for developing VAP (35).·

Based on the onset, VAP can be divided into early and late. Early onset VAP occurs 48 to 96 hours after intubation and is associated with antibiotic-susceptible organisms. Late-onset VAP occurs more than 96 hours after intubation and is associated with antibiotic resistant organisms such as *Pseudomonas aeruginosa*, *methicillin-resistant Staphylococcus aureus*(MRSA),*Acinetobacter*species, and *Enterobacter* species. The latter type of VAP is accompanied by powerful pathogens and consequently has high mortality.

VAP is described as the most common nosocomial infection of intensive care unit [36-38]and is often fatal, although attributable mortality varies. The incidence differs between units (ICUs, HCUs (high-care units) and HDUs (high-density units)), hospitals (public and private sector) and countries (developed and developing). The range varies from 9% to 27% in Europe and America [36,37,39] Mortality rates in patients with VAP range from 20% to50% and may be as high as 70% when the infection is caused by multi-drug resistant, invasive pathogens . VAP attributable mortality is difficult to quantify because of confounding effects of associated conditions, but has been estimated to increase mortality by 30% and even twofold in critically ill patients [39, 40]. Making' a timely and accurate diagnosis of VAP is critical as delayed administration of appropriate antibiotics increases mortality [36]. And inappropriate use of antibiotics increases cost, incurs the risk of adverse drug reactions, and selects for resistant microbial flora that increase morbidity and mortality [36].

A narrative and systematic review analysis studies in Egyptian University Hospitals shows that Most of the 37 studies on which analysis were done were concerned with the risk factors, causative organisms, and incidence. The most common risk factors were leukopenia, thrombocytopenia, high CRP, metabolic acidosis, nasal endotracheal intubation, re-intubation, prior antibiotic use, and contaminated ICU environment with lack of infection control measures, use of antacids and H2 blocker, corticosteroids use, and coma. The most common causative organisms were Pseudomonas aerogenosa, Klebsiella, Escherichia coli, Staphylococcus aureus, Acinetobacter, Candida and Proteus.[41].

An Academic dissertation which was presented in Finland showed that critical care nurses' knowledge of evidence-based protocols and guidelines for avoiding complications associated with intubation and mechanical ventilation was shown to be limited: the mean knowledge score in the baseline measurement was 54.4% of total score. Thirty percent of the critical care nurses failed to achieve a mean score of 50%. These results are in line with

previous international cross-sectional surveys, which established that there was a lack of knowledge and a need for continuing education .In addition, this study confirms that critical care nurses' skills in adhering to evidence-based protocols and guidelines for avoiding complications associated with intubation and mechanical ventilation are currently limited: the mean skills score in the baseline measurement was 47.8% of total score. Seventy three per-cents of the critical care nurses failed to achieve a mean score of 50%. In addition, the quality of observed pra6ctices prior to, during and post ETS events were significantly lower than the recommended care: the mean skills score ranged from 54.9% (Study I) to 60.8% (Study IV), which is in line with several previous studies(42).

A descriptive cross-sectional study carried out in 37 ICUs of 23 hospitals in Sana'a city, Yemen indicates The nurses' knowledge scores ranged between 13.3% and 80% with a total mean score of 47.32 ± 13.6% (7.1 ± 2.03 on 15 items) knowledge of evidence-based strategies for preventing VAP is low among the majority of nurses working in Yemen ICUs (73.4% of nurses scored <60%). This low score reflects the fact that Yemen ICUs are staffed with general trained, diploma holder nurses, the lack of in-service training, and the absence of consistent policies in ICUs. Holding a bachelor degree in nursing and acquisition of a short course in respiratory therapy was shown to be associated with better knowledge scores. These results stress the need of hospitals to organize and implement in-service educational programs for infection prevention in general, and for VAP prevention in particular, for all staff involved in the care of the mechanically ventilated patients. The ICUs should develop and review their policies and procedures (if they have) to include the current EBGs for VAP prevention. For nursing schools and colleges, the curriculum of the basic nursing programs should be modified to include the most recent EBGs for VAP prevention (43).

Retrospective study done America at long-term acute care hospital During the 22-month study period (April 1, 2006–January 31, 2008) showed that there were 157 long-term acute care hospital (LTACH)admissions involving 88 patients who required mechanical ventilation (some patients were admitted on more than 1 occasion). A total of 23 CDC defined cases of VAP occurred in 19 patients during 13,746 ventilator-days. The cumulative VAP incidence was 14.6% (23 of 157 admissions), and the incidence rate was 1.67 cases per 1,000 ventilator-days, which was a 56% reduction from the VAP rate of 3.8 cases per 1,000 ventilator-days before the implementation of a VAP-bundle approach (relative risk, 0.44 [95% confidence interval, 0.27–0.70]; *P=0.*001). The VAP rate in the LTACH is lower than the VAP rate reported in acute care hospitals. Cases of VAP in the LTACH were frequently

polymicrobial and were associated with multidrug-resistant pathogens and increased length of stay. The guidelines from the Centers for Disease Control and Prevention that are aimed at reducing cases of VAP appear to be effective if applied in the LTACH setting (44).

A quasi-experimental study conducted in an ICU of a large teaching hospital in Malaysia indicates that Nurse-led education significantly increased nurses' knowledge of ($t[70] = -36.19$; $p < 0.001$) and compliance with ($t[65] = -21.41$; $p < 0.001$) ventilator care bundle VCB practices. The incidence of VAP, which was 39 per 1,000 ventilator days during the two-month period before intervention, dropped to 15 per 1,000 ventilator days during the two-month period following intervention (45).

Summary of literature review

Hospital acquired infections (HAIs), defined as infections acquired during the patients' stay in hospitals, constitute a major worldwide public health problem despite advances in our understanding and control of these infections (1). Over 1.4 million people worldwide suffer from HAIs with 5- 10% of patients admitted to modern hospitals in the developed world acquiring one or more of these infections. The risk of HAI in developing countries is 2- 20 times higher than in developed countries (2).The magnitude of the problem in terms of expenditure and human suffering being enormous.

Ventilator associated pneumonia (VAP) are the most common complications and cause substantial morbidity, mortality, and increases expense for treatments for mechanically ventilated patients. VAP was also the second most common nosocomial infection in the intensive care unit (ICU) and the most common in mechanically ventilated patients (15, 16). Multiple risk factors influence the development of VAP. In the prevention of VAP, Nurses, working in the ICUs has to play a leading role in taking initiatives that aimed to ensure quality of care and thus to enhance patient safety which includes prevention of VAP. However, a significant number of studies indicated that most nurses lacked the required knowledge about prevention of VAP and the majority of them did not practice properly.

Many factors influence nurses' knowledge and practice, such as age, gender, years of working experience, and education. Based on a literature review, it was found that level of nurses' knowledge and practices regarding prevention of VAP were not congruent and also its relationship was still inconsistent.

Despite the availability of some studies in the developed countries, studies investigating level of nurses' knowledge and practices regarding prevention of VAP, particularly in Sub-Saharan Africa are very limited, And those available have different designs and inconsistent results , especially in Ethiopia there is no any published local literature which show the magnitude of the problem. Further investigation is needed as most studies have focused on nurses' knowledge rather than both knowledge and practice. Therefore, this study was aimed at assessing knowledge and practice of nurses working in the ICU towards prevention of VAP at selected governmental Hospital Addis Ababa, Ethiopia, 2015

2.1 Conceptual framework of the study

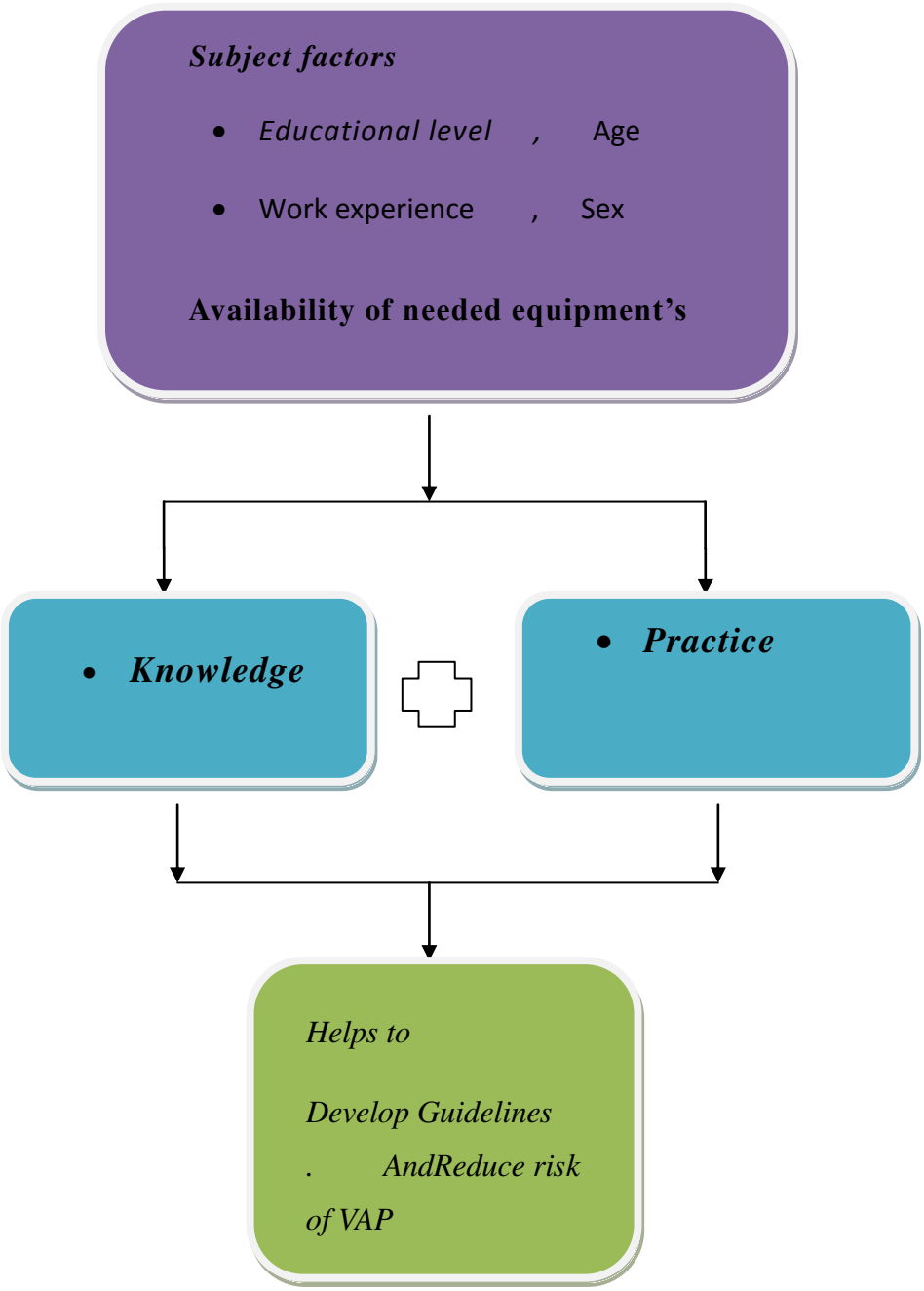

Figure 1 Conceptual framework on prevention of VAP and its associated factors . By nurses at selected public hospitals, Addis Ababa, Ethiopia, 2015.

This conceptual framework is designed by PI.

3. Objectives

3.1. General objective

- To assess the knowledge and practice of nurses working in the ICU towards prevention of VAP at selected governmental Hospital Addis Ababa, Ethiopia, 2015.

3.2. Specific objectives

- To determine the existing knowledge of nurses' working in intensive care units towards prevention of ventilator associated pneumonia (VAP) at selected governmental hospitals in Addis Ababa, Ethiopia, 2015.
- To determine the existing practice of nurses' working in intensive care units towards prevention of ventilator associated pneumonia (VAP) at selected governmental hospitals in Addis Ababa, Ethiopia, 2015.
- To determine the association between the dependent variable with independent variables such as Socio-demographic characteristics, Educational level and years of experience.

4. Methodology

4.1. Study area

Addis Ababa, capital of Ethiopia, is situated at the heartland of Ethiopia, with a population of 3,384,569 in an area of 540 square kilometers. The city comprises 6 zones and 28 woredas. The population pyramid is broad based, typical of a developing world. People from different regions of Ethiopia populate the city; the main causes of morbidity and mortality are communicable diseases that could be prevented through interaction of primary health care activities. The city consists of a total of 79 health facilities including Hospitals; out of which 5 hospitals owned by Addis Ababa Health Bureau ,4 hospitals owned by Federal MOH (Central), 1 Addis Ababa University 2 Ministry of defense , 1 police force hospitals which provide different health services. In addition there are about 23 health center, 9 clinic, and 34 health posts. Among 13 public Hospitals TikurAnbessa, St.paulos, Yekatit12, Zewditu and Minilik the II conveniently selected because they have an ICU. The study conducted in these five intensive care units at Addis Ababa selected governmental hospitals

4.2. Study period

The study was conducted in five selected governmental hospitals Addis Ababa from March 2015 to July2015.

4.3. Study design

The study design was conducted using quantitative and qualitative descriptive cross-sectional study design. This study design is relevant because cross sectional studies provide advantage for single time or a snapshoot data gathering with regard to the time allocated for the study to be accomplished.

4.4. Source population

Nurses working in the selected governmental hospitals ICU at Addis Ababa, Ethiopia.

4.5. Study population

All nurses working in the five selected governmental hospital ICUs during the data collection period.

4.6. Eligibility criteria

4.6.1. Inclusion criteria

- Nurses working in intensive care units for at least 6 month or more and who volunteer to participate in this study during the study period were included.

4.6.2. Exclusion criteria

- Nurses who refuse to participate in this study.
- Nurses with less than 6 months of work experience.

4.7. Sample size

The actual sample size for the study is fixed by the formula of single population proportion formula for single proportion population.

$$n = \frac{(Z_{\alpha/2})^2 \, p \, (1-p)}{d^2}$$

Where, z – confidence interval corresponding to 95% (1.96)

P – Prevalence rate 50% 1+ni/N1+384/149

n – Minimum sample size our sample size is then,

$$n = \frac{Z^2P(1-P)}{d^2} = \frac{(1.96)^2 x 0.50(1-0.50)}{(0.05)^2} = 384$$

Since the total number of nurse working in ICU of selected hospitals is N= 149 which is less than 10, 000, a finite population correction formula was applied.

Therefore, $n_f = \frac{n}{1+ni/N} = \frac{384}{1+384/149} = 107$ Where, ni – initial and nf – final sample size

To adjust for non response rate 10% of the calculated sample size added to the n therefore n= 117 nurses hence the minimum sample size required for this study was 117 nurses.

4.8. Sampling technique and procedures

A total of 28 hospitals was identified in Addis Ababa city, of those 28, thirteen were governmental, four of which owned by federal ministry of health, five by Addis Ababa regional health bureau , one owned by Addis Ababa University ,two by Ministry of defense and one owned by the Federal police force. All 13 governmental hospitals were listed, and five hospitals (Black lion, St.Paulos, Minilic II, Zewditu and Yekatit 12 hospitals) were selected using simple random selection method. Study subjects were included conveniently based on proportional allocation of the hospitals (fig 2).

Proportional to size allocation formula = $\frac{n_i * n_f}{N}$

Where n_i - number of nurse in hospital n_f - final sample of the study N-total number of nurse in the selected hospitals

- TkurAnbesa hospital = $\frac{49*117}{149} = 38$
- Zewditu hospital= $\frac{33*117}{149} = 25.9 \sim 26$
- Minilik II hospital= $\frac{14*117}{149} = 10.9 \sim 11$
- Yekatit 12 hospital= $\frac{11*117}{149} = 8.6 \sim 9$
- St.Paulos hospital= $\frac{42*117}{149} = 32.9 \sim 33$

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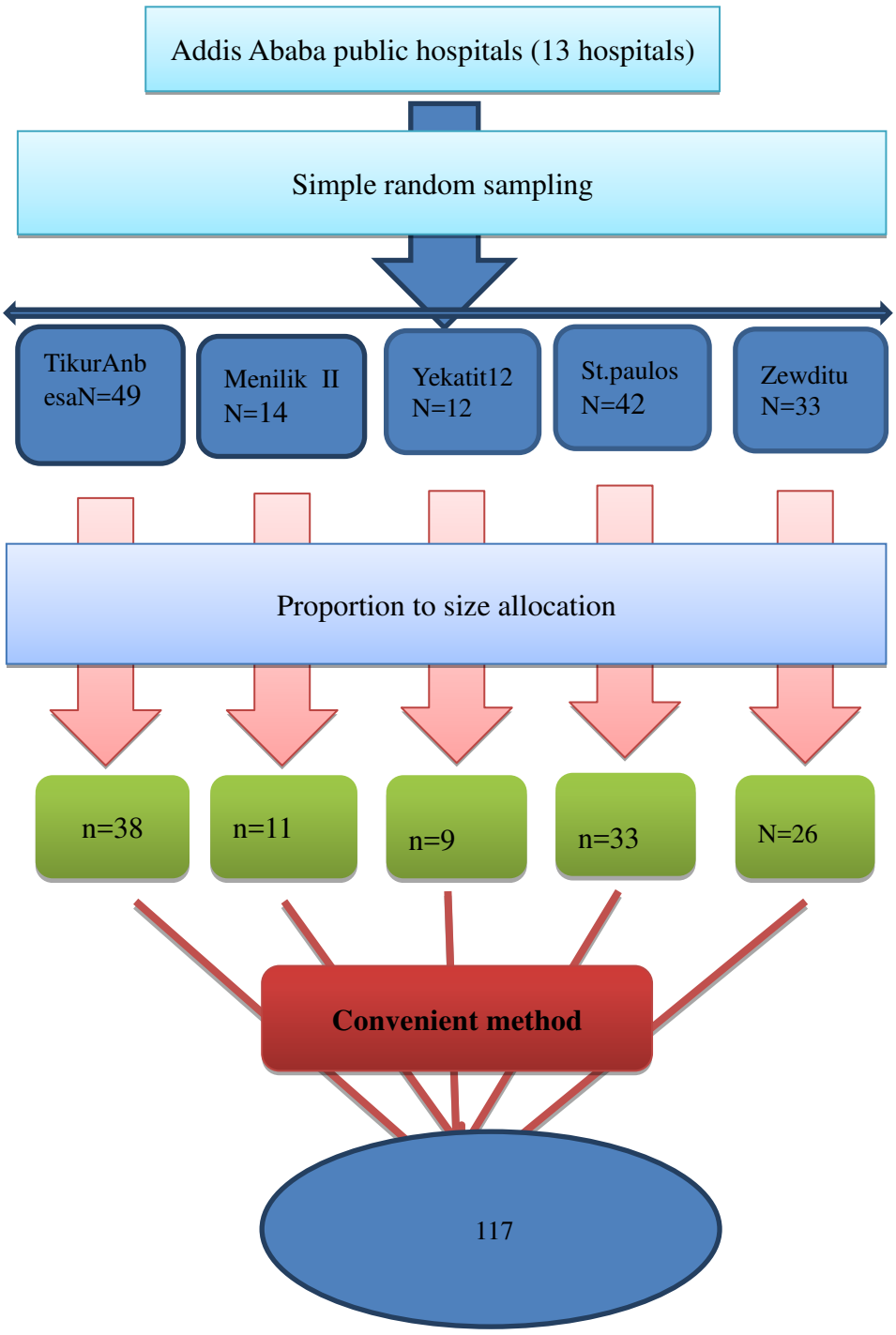

Figure: 2- A schematic representation of sampling method

4.9 Variables

4.9.1 Dependent variable

- *Knowledge*
- *Practice*

4.9.2. Independent variables

- ***Socio demographic characteristics***
    - Age
    - Sex
    - Educational level
- Year of work experience

Operational definitions

1. Knowledge, - **I**n this study it refers to the correct level of response of the subject regarding the prevention of ventilator associated pneumonia elicited through structured questionnaire participants who selected a correct choice from a certain item and above mean score value were considered to be knowledgeable.

2. Practice, - In this study it refers to the nursing actions done by the nurses on the subject regarding the prevention of ventilator associated pneumonia such as hand washing, suctioning from the ETT/tracheotomy and oral care, Participants who adhere to accepted ICU nurse practice to prevent VAP and above mean score value were considered to have good practice on that item.

3. Year of experience, -In this study it refers to the time duration of the nurses working in the ICU which is categorized in to 6 month to ≤4 year and 5 to ≤9 years.

4.Educational level, - In this study it refers to the educational level which the nurse currently have , which is categorized in to Diploma ,BSC , MSC and Other.

4.11 Data collection tools and process

A structured Self-administered questionnaire and observational checklist were used to assess the knowledge and practice of nurses working in the intensive care units. Both instruments were designed by the principal investigator as it appears in the literature review [48, 54].

1. For structured questioners Data collection was conducted by the trained data collectors and the supervisor. The structured self-administered instrument involves questions that assess Socio-demographic characteristics and knowledge of nurses at the ICU.
2. An observation checklist designed by Principal investigator was used to assess the actual nurses' practice. The observation was conducted by Principal investigator and another trained data collector. Nurse attending mechanically ventilated patients were observed conveniently during the three shifts for at list 3 hours during the data collection period. Four data collectors and one supervisor were recruited based on previous experience data collection. Training was given to data collectors and supervisors for one day.

Pre –test :- Both the structured self-administered questionnaires and the check list were pre tested for its clarity and to test what it is intended to test. Question that has problems of clarity was amended before the actual data collection period .pre-tested subject were excluded from the actual data collection.

4.12. Data quality control

During data collection principal investigator checked data for its completeness and missing information at each point. To ensure accuracy, Validity of the self-administered questionnaire and the standard observational checklists guide for the assessment was adopt and edited by my supervisor, pre-test was done the questionnaire was pre tested for the relevance of dependent and independent variables to avoid any confusion during actual data collection period. The principal investigator checked nurse's response one week prior to the actual data collection. This was helpful for the investigator to screen out vague questions and modify some of the question item as soon as possible, Further more data were checked during entry into the computer before analysis and the incomplete data were discarded.

4.13. Data processing and analysis

Data gathered from study participants was cleaned, coded and entered in to computer.Incomplete responses were excluded in the analysis. Statistical package for Social Sciences (SPSS) version 20 was used for analysis and descriptivemethods such as frequencies, proportions, and Chi square tests used toanalyze the data. Results were presented in frequency tables and graphs.

4.14. Dissemination and utilization of the result

The result of this study disseminated to Addis Ababa University, College of Health Sciences Department of Nursing and Midwifery. A copy of the results submitted to the studied hospitals. The result presented in local and International conferences and sent for publication in scientific journals.

4.15. Ethical consideration

Ethical clearance sought from the Departmental review committee of Department of Nursing and Midwifery, College of Health Science, Addis Ababa University. Letter of permission was obtained from Medical Directors of the study settings before the actual data collection period. Permission letter provided to respective head nurses of the study units. Information was given to study participants about the purpose and procedure of study and they were observed, informed consent was obtained and confidentiality and privacy was ensured.

5.1 Results

A total of 117 nurses working from randomly selected five hospitals were included in the study. The response rate of the study participants was 100%. Sex characteristics of the study participant were, 66 (56.4%) female with the remaining 51 (43.6%) male. Of those 117 participants, majority 80 (68.4%) were aged between 23 and 27, and 37 (31.6%) between 28 and 32 with mean and SD of 26.23 $\pm$ 2.73, and median value is 26 (Min=23: Max=32). Concerning their work experience in ICUs 63 (53.8%) of the respondents had ICU experience of 6 months to 4 years and 54 (46.2%) had 5 to 9 years of work experience. With regard to the educational level of the nurses, majority 101 (86.3%) were graduated in Bachelor of Science in nursing and the remaining 16 (13.7%) were Diploma graduates as indicated in table 1.

Table1. Socio-demographic characteristics of nurses working in selected governmental hospitals ICUs in Addis Ababa (2015) (N=117)

Variables	Frequency(N)	Percent (%)
Total sample	117	100
Gender		
Male	51	43.6
Female	66	56.4
Age		
23-27	80	68.4
28-32	37	31.6
Mean +SD = 26.23$\pm$2.727 Median =26 (Min = 23 : Max =32)		
level of education		
Diploma	16	13.7
Degree	101	86.3
Work experience		
6months-4yrs	63	53.8
5yrs-9yrs	54	46.2

5.2 ICU Nurses knowledge concerning prevention of ventilator associated pneumonia in Addis Ababa selected governmental hospitals (2015)

Mean value was used to classify ICU nurses knowledge and practice about ventilator associated pneumonia. Nurses knowledge or practice score above the mean value (15.97) were taken as having adequate knowledge and those who score below the mean are considered as having poor level of knowledge or practice.

There were 27 knowledge related questions about the prevention of VAP and level of Knowledge of nurses was calculated out of 27. Accordingly the result showed that, 71 (60.7%) are knowledgeable on prevention of VAP whereas 46 (39.3%) are not knowledgeable about prevention of VAP in the ICU setting. The mean score and standard deviation of knowledge of nurses working in the ICUs, about prevention of VAP was 15.97 ± 3.23 with the minimum 5 and maximum 23. Minimal number of respondents 33 (28.2%) correctly answered items number 10 and 14 about Closed suctions systems are the recommended suction systems for intubated patients and Colonization of the subsequent aspiration is the cause of Ventilator Associated Pneumonia (VAP), while most 116 (99.1%) respondents correctly responded to item 18 which was about the need of educating ICU nurses about prevention of nosocomial infection.

Fig. 3 Level of knowledge of ICU nurses working in selected hospitals in Addis Ababa 2015

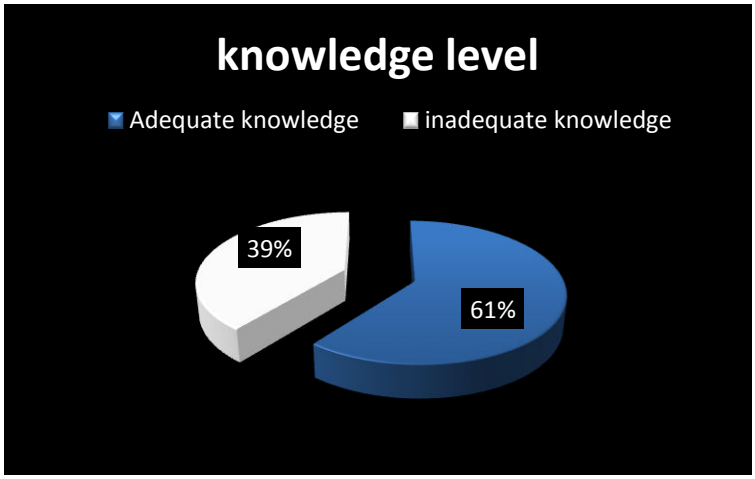

Table-2 Distribution of knowledge of ICU nurses working in selected hospitals in Addis Ababa towards the prevention of VAP, 2015

Items (questions) and correct answers	Frequency	Percent %
Recommended route of patient intubation is- Oral intubation	74	63.2
Recommended Patient positioning-Semi recumbent positioning	50	42.7
Endotracheal tubes with extra lumen for drainage of sub-glottic secretions ↓ risk for VAP	78	66.7
Factors contributing to bacterial colonization of the aero digestive tract include- Contaminated hand of health workers, respiratory therapy equipment and Aspiration of contaminated secretion in to the lower airway.	**106**	**90.6**
A nurse is required to discard a suction catheter Immediately after a single use	59	50.4
Frequency of change in suction systems every new patient (needed)	49	41.9
Frequency in changing humidifiers Every 2-7 days (if necessary)	37	31.6
Suction catheter Insertion into the ETT Is a sterile procedure	82	70.1
Dusting of respiratory and bedside equipment with antiseptic - Every shift and whenever soiled.	81	69.2
Recommended type of suction systems is Closed systems	**33**	**28.2**
Head of the bed elevation should be range from 30-45 degrees.	**43**	**36.8**
A nurse caring a ventilated patient is required to wear sterile gloves during ETT suctioning	**44**	**37.6**
A nurse caring a ventilated patient is required to wash hands Before and after oral / ETT suctioning	**103**	**88.0**
VAP comes from: Colonization of the subsequent aspiration	**33**	**28.2**
Oral care using a swab moistened with mouth wash and water - Every 4-6 hrs and when necessary	64	54.7
Prolonged use of Stress ulcer prophylaxis to a ventilated patient - May increase the colonization density of the aero digestive tract.	44	37.6
High nurse to patient ratio in ICU- increased risk for VAP	77	68.5
Educating ICU nurses on prevention of nosocomial infection helps to- ↓ rates of VAP	**116**	**99.1**
Frequency of ventilator circuit Replacement change -Every new patient (clinically indicated)	60	51.3
Chest physiotherapy for ICU patients' To reduce the risk for VAP	**97**	**82.9**
Adjustable beds Vs non-adjustable -Adjustable ↓ the risk of VAP	80	68.4
ETT suctioning should be done to patient. As needed.	107	91.5
Early weaning of mechanical ventilator mode Reduces risk of VAP	67	57.3
Over feeding of ventilated patient may ↑ risk of aspiration leading to- ↑ the risk for VAP	82	70.1
ETT with well maintained pressure cuff - decrease the risk for VAP	72	61.5
Unplanned extubation can↑ risk of aspiration lead to↑ risk of VAP	83	70.9
Principles of VAP Prevention -All(Staff education, Colonization reduction & Aspiration avoidance)	91	77.8

5.3 Association between knowledge of ICU nurses and independent variables in selected hospitals in Addis Ababa, 2015

As indicated in table 3 below Age has highly statistically significant association with knowledge. ICU nurses aged between 28 and 32 years had adequate knowledge compared to ICU nurses aged between23 and 27 years $X^2(1)$ =7.101 (p - 0.008). Similarly, work experience is highly significantly associated with knowledge $X^2(1)$ = 18.181 (p-0.000), ICU nurses with ICU work experience of five to nine years had adequate knowledge compared to ICU nurses with experience of 6 months to ≤ 5 years work experience. Sex and educational level were also associated with Knowledge, $X^2(1)$= 5.156 (p- 0.023) and $X^2(1)$ = 4.175 (p- 0.041) respectively. Female nurses working in the ICU had adequate knowledge compared to the male and nurses with educational level of Bachelor of Science had adequate knowledge compared to the Diploma holders.

Table3. Association between socio-demographic characteristics andknowledge of nurse's working in the ICU toward the prevention of VAP (N=117).

Variables	Level of knowledge Vs Socio-demographic		X^2	*Df*	P-value
	Adequate(n)	Inadequate(n)			
Age					
23-27years	42	38	7.101	1	**0.008***
28-32years	29	8			
Sex					
Male	25	26	5.156	1	**0.023***
Female	46	20			
Work experience					
6month to 4 years	27	36	18.181	1	**0.000***
5yr. to 9 years	44	10			
Educational level					
Diploma	6	10	4.175	1	**0.041***
Degree	65	36			

.* P< 0.05

5.4 ICU Nurses practice towards the prevention of ventilator associated pneumonia

A total of 60 nurses working from the randomly selected five hospitals were included in the study. Concerning sex characteristics of the study participants, 66.7% (40)were female with the remaining 33.3 %(20) male. Of those 60 participants, majority 71.7% (43) were aged between 23 and 27, and 28.3% (17) between 28 and 32 with mean and SD of 26.2±2.679, and median value is 26, (Min=23: Max=32). concerning to their work experience in ICUs 45 %(27) of the respondents had experience of 6 months to 4 years and 55% (33) had 5 to 9 years of work experience. With regard to the educational level of the nurses, majority 76.7 % (46) were graduated in Bachelor of since and the remaining 23.3% (14) were Diploma.

Throughout the period of the study, 60 observations of nurses on VAP prevention practices were conducted during the three shift period. There were an observation checklist about the prevention of VAP and levels of practice of nurses were evaluated based on the checklist. Mean value was used to classify ICU nurses practice ,a score above the mean value (15.47) were taken as having Good level of practice and those who score below the mean are considered as having poor level of practice. Accordingly the result showed that, 32 (53.3%) had Good performanceand 28 (46.7%) had inadequate or poor level of performance about prevention of VAP in the ICU setting. The mean score and standard deviation of practice of nurses were 15.47 ±2.029 with the minimum 12 and maximum 18. Based on the results presented in table4, which there were six items of practice that highest percentage of nurse's practiced they are: 58(96.7%) of observed participant wash Hand after contact with a source of microorganisms, 46 (76.7%) Use of alcohol rub as for hand washing, 51 (85%) Insuring environmental cleanness during suctioning, 48(80%) Insert the catheter into the ETT gently by using aseptic technique , 60(100%)Clean mouth using toothbrush or gauze moistened with mouth wash and Rinse with a clean swab and Suction secretions as they accumulate, if necessary.

And the table also showed that six Practice questions that the lowest Percentage of Nurses correctly practiced, of the sixty subjects 3.3%wash their Hand before giving an oral care, 6.7% Apply water soluble jelly to patients lips, 10% wash their Hand Before contacting thepatients, 13.3% Hand washing before suctioning, 20% Wear sterile gloves during suctioning from ETT, 25% wash their Hand after patient contact.

According to table4, the result revealed that concerning hand washing before entering ICUnone of the subjects were practiced correctly and participants were discard suction tube immediately after single use and also the subject missed practicing documentation of the procedures.

5.5 Practice of participants towards the prevention of VAP

The result showed that, 28 (46.7%) of the respondents are found to be inadequate or poor level of performance while the remaining 32 (53.3%) areGood level of performance about prevention of VAP in the ICU setting.

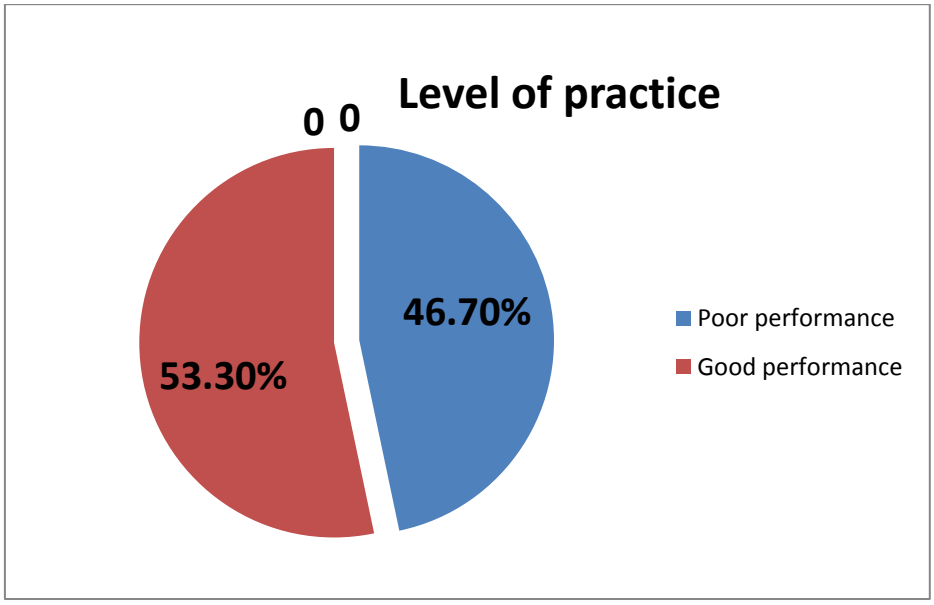

Figure 4: Level of practice of ICU nurses working in selected hospitals in Addis Ababa . 2015.

Table 4 Observed Hand washing, Suctioning and Oral care practice of nurses expressed in percentages and number values (N=60).

Hand washing	**Yes**	**No**
Hand washing before entering ICU	0(0%)	60(100%)
Before patient contact	12(20%)	48(80%)
After patient contact	14(23.3%)	46(76.7%)
After contact with a source of microorganisms	58(96.7%)	2(3.3%)
Use of alcohol rub	46(76.7%)	14(23.3%)
Suctioning from the ETT/tracheotomy		
Hand washing before the procedure	8(13.3%)	52(86.7%)
Use of sterile gloves for ETT suctioning	12 (20%)	48(80%)
Prepare sterile equipment required during suctioning	46(76.7%)	14(23.3%)
Maintaining environmental cleanness	51(85%)	9 (15%)
Use of aseptic technique in inserting the catheter into the ETT	48(80%)	12(20%)
Discard suction tube immediately after one single use	0(0%)	60(100%)
Hand washing after the procedure	2(3.3%)	58(96.7%)
Documentation of the procedure	0(0%)	60(100%)
Oral care		
Hand washing before giving oral care	2 (3.3%)	58(96.7%)
Use of clean gloves for oral care	60(100%)	0(0%)
Position a patient in a semi recumbent	54 (90%)	6(10%)
Clean mouth using toothbrush or gauze moistened with mouth wash	60(100%)	0(0%)
Rinse mouth with a clean swab	60(100%)	0(0%)
Suction secretions as they accumulate(if necessary)	60(100%)	0(0%)
Apply water soluble jelly to patients lips	4 (6.7%)	56 (93.3%)
Clean equipment and return it to its proper place	60(100%)	0(0%)
Hand washing after giving oral care	60(100%)	0(0%)
Documentation of the procedure	0(0%)	60(100%)

5.5. Association between practice and socio-demographic characteristics

Chi-square test reveals the following results; there were statistical significant association between genderand practice$x^2(1) = 5.563$; p-value = 0.010. Concerning age group, educational level, and work experience, the Chi-square value indicated that there were no statistical significant association with practice toward the prevention of VAP among nurses worked in ICU with a $x^2(1) = 0.375$; p-value = 0.540,$x^2(1) = 0.106$; p-value= 0.744,$x^2(1)$ =0.097; p-value =0.755 respectively (table5).

Table5. Association between socio-demographic characteristics and practice of nurse's working in the ICU toward the prevention of VAP (N=60).

Variables	Level of practice Vs Socio-demographic		X^2	*df*	P-value
	Good(n)	Poor(n)			
Age					
23-27years	24	19	0.375	1	0.540
28-32years	8	9			
Sex					
Male	6	14	6.563	1	**0.010***
Female	26	14			
Work experience					
6month to 4 years	15	12	0.097	1	0.755
5yr. to 9 years	17	16			
Educational level					
Diploma	8	6	0.106	1	0.744
Degree	24	22			

. * P< 0.05

DISCUSSION

The main objective of this study was to assess the knowledge and practice of nurses working in the ICUs towards prevention of VAP at selected governmental hospitals in Addis Ababa. Association between independent andoutcomevariables was also examined. The results of this study were based on the primary data gathered from nurses who had been working the fiveselected hospitalICUsin Addis Ababa. One hundred and seventeen participants were included conveniently for the self-administeredquestionnaireswhich assessed knowledge and 60 amongst the 117 participants were also conveniently observed for their practicetowards the prevention of VAP.

There were 27 Items containing self-administered questionnaires,andthe total score obtainable was 27. Participantswere considered having adequate knowledge when their score is above the mean value (15.97), and 23 items containing practice questions through observation checklist which evaluates practiceandParticipants were considered good practice when their score is above the mean value (15.47).

Nurses' Knowledge toward the Prevention of VAP

According to this study Majority (56.4%) were female critical care providers. It is believedthat the nursing profession is dominated by females. Among the participants, 68.4% belonged to the age group of 23-27 years, 86.3% were degree holder and 53.8% were 6month to 4years total workingexperience whichmight indicates that nurses were moved across wards and might not have adequate time to gain specific knowledge and practice in that areas or nurses might change their profession or left the hospital shortly.

The current Finding of knowledge on VAP prevention is congruent with a cross-sectional study done in Dar-essalaam, Tanzania 2012, majority of the study subject of 118 subjects 54.2% of participants have an excellent knowledge scores[48]. In other study done in Cairo, Egyptin 2013where the study conducted at three critical care units with a convenience sample of 45 critical care nurses at Cairo university Hospitals where 90% had unsatisfactory knowledge Score [46].These differences might be due to the fact that majority of the study subjects in the Egyptian study were diploma holders and44.4% were internship nurses who had less than 2 years ofexperience innursing or may be due to the smaller sample size in the Egypt's study. In other study which was conducted in India, of the 138

critical care providers 71(51.4%) were diploma and 67(48.8%) degree holders, amongst all participants, 55.8% had adequate knowledge and 44.20% had inadequateknowledge (47), indicating the proportion of study subjects with inadequate knowledge is less in the context of the current study.the variation between the two studies possibly due to most of the study participant in the current study are degree holders where as majority in Indian study were diploma holders.

According to the findings in this study participants demonstrated adequate knowledge in the areas of recognizing educating ICU nurse on prevention of nosocomial infection can help decrease the risk of VAP, the need of ETT suctioning to ventilated patient as needed, performing hand washing for reducing the risk of VAP, Similarly, most nurses knew that Factors contributing to bacterial colonization of the aero-digestive tract were Contaminated hand of health workers ,Contaminated respiratory therapy equipment and Aspiration of contaminated secretion in to the lower airway. This finding indicates that nurses had knowledge of VAP prevention in areas of general infection control, which may be gained this general knowledge from their VAP prevention information from the formal education and/or ICU work experiences.

However, the study subjects lack knowledge in areas of VAP prevention including: type of suction systems recommended for intubated patients, frequency recommended to change humidifiers, range of head of the bed elevation, and effect of the prolonged use of stress ulcer prophylaxis to a ventilated patient. This might be due to limitation of the study participants on evidence-based practice of VAP and gaps in the curriculum that may not be incorporating in the Diploma and bachelor program.

In the current study educational level of the study participants showed significant association in their knowledge, nurses with Bachelor degree were found having adequate knowledge compared to nurses with Diploma holders, $X^2(1) = 4.17$ ($p = 0.0.041$), due to extensive nature of education given to bachelors.Age group was also found associated with knowledge level, age groups 28 to 32 demonstrated adequate knowledge compared to age groups between 23 and 27, $X^2 (1) = 7.10$ ($p = 0.008$). Possibly due to Agegroup 28 to 32 hasa better work experience than age 23 to 27. Sex was also found with Knowledge, female nurses demonstrated adequate knowledge compared to male nurses, $X^2 (1) = 4.17$ ($p=0.023$) this may be caused by the smaller sample of male nurses relative to the female

sample at the study areaand association between ICU working experience and knowledge was found highly statistically significant, X^2 (1) = 18.18 (p< 0.001).5-9 years' work experience are more knowledgeable than less than 4 years of work experiencethe reason might be that more experienced nurses have longer exposure to the day to day activity of care which might help them to identify the problem and find the solutions than less experienced nurses, so that, Seniority indicates better knowledge.

Finding of the current studyindicatesthat there is significant but a weak association between knowledge score on prevention of VAP and educational qualification whereX^2 (1) = 7.10 (p = 0.041)which implies that Nurses holding bachelor's degrees had significantly scores better than nurses holding diploma, This is similar with the study done in Sana'a city, Yemen, which is A descriptive cross-sectional survey carried out in 37 ICUs of 23 hospitals p value=0.007 .this similarity is possibly due to both study have high number of degree holders,Hence, knowledge is directly proportional to the level of education(49).

The current study also revealed that the study group with 5 to 9 year of work experience have better knowledge than less experienced one with a X^2 (1) = 18.181 p value <0.001which is a strong association. This is in line with a study done in Finland adult general ICU 2010 (n = 101) in a single academic centre the finding indicates that More experienced nurses performed significantly better than their less-experienced colleagues **(50).** The similarity might be due to build-up of knowledge through time increase knowledge and problem solving ability at the specific setting.

Unlike other studies this study found an association between knowledge with sex and Age, which implies females and age group between 28 to32 are more knowledgeable than male andage group 23 to 27, with a X^2 (1) = 5.156,p value 0.023 and X^2 (1) = 7.101,p value 0.008respectively.

Nurses' Practice toward the Prevention of VAP

This study revealed that 53.5% of the studied subjects showed adequate skill above the total mean score. This finding indicates that significant numbers of subjects (46.7%) were not provided good nursing practices towards the prevention of VAP.

Each item testing nurses' practice was examined on prevention of VAP, the Frequency of correct performance for each item in this study showed a better performance than the study conducted in Dares Salaam, Tanzania 2012. Almost all 100% of the participants of this study apply clean gloves during oral care, clean mouth using toothbrush or gauze moistened with mouth wash, Rinse mouth with a clean swab, Suction secretions as they accumulate, Clean and return equipment it to its proper place and wash their hands after oral care. Similarly, 96.7% of the observed participants as wash their hands after contact with a source of microorganisms, 76.7% used alcohol for hand rub 76.7% prepared sterile equipment required during suctioning, 80% Insert the catheter into the ETT gently by using aseptic technique and 90% of the subjects Position a patient in a semi recumbent during oral care. This indicated that nurses had performed good practices in these areas. This difference is possibly due to the general orientation given to nurses in the ICU settings.

Observation on some areas such as: hand washing practice before contacting the patient, giving oral care and after performing suctioning of ETT/tracheotomy, after patient contact, Application of water soluble jelly to patient's lips, and also nurses hand washing practice before entering ICU revealed that:, 20% wash their hands before contacting the patient, 3.3% wash their hands before giving oral care and after suctioning from the ETT/tracheotomy,13.3%wash their hands before suctioning, 23.3% After patient contact,6.7% Apply water soluble jelly to patient's lips, and also 100%observed nurses never practice to wash their hands before entering ICU, these finding is congruent with the same study done in Tanzania 2012 (48).This similarity might be due negligence or lack of awareness of nurses in the contribution for hand washing practice to the prevention of VAP.

Another area where nurses lacked performance was that discarding suction tube immediately after single use, and also the subject 100% missed practicing documentation of the procedures. This indicated that nurses had some limited practice; therefore, it is needed to provide update information to the nurses in these areas.

Finding of the current studyrevealed that there are no significant difference in practice between participants with education level as found X^2 (1) = 0.106(p = 0.744), age groups as found X^2 (1) = 0.375(p = 0.540) and between participants with different years of ICU working experience X^2 (1) = 0.097(p = 0.755).Which means the nurses socio-demographics characteristics, except gender X^2 (1) = 6. 563 (p = 0.010), are not significantly affect the practice of nurses this is implied that the performance level is influenced by other factors need more analysis. But females have better practical skill than males this might be the presence of highest numbers of female nurses at the study area.

Despite the availability of some studies in the developed countries, studies investigating level of nurses' practices regarding prevention of VAP are very limited, and finding of the practice cannot be broadly discussed in comparison to other similar studies. Therefore, it needs farther investigation and can be used as base line for future studies.

Finally, the study finding revealed that nurses wereperformed good practices However; a significant number (40.7%) of subjects lacked performances. This indicated that nurses havesomelimited practice; therefore, it is needed to provide update information to the nurses in these areas.

STRENGTH AND LIMITATION OF THE STUDY

Strength of the Study

- The data was collected using structured questionnaires and observational check list adapted and modified from other researches.
- Data collators were health professionals
- Reduction of Hawthorne effect i.e. participants' awareness of being in a study may cause them to change their practice so that to prevent this effect observer did exact observation after three days when the observed continued to perform their activities according to their normal day to day practice.

Limitation of the study

- The design of this study was descriptive cross-sectional study, with features of single data gathering, information provided to study participants may alter behavior during observation. Therefore, these drawbacks may limit to draw conclusion beyond the context of the study settings, but can be used as base line for future studies.
- Since the study design was cross-sectional method, the direction of causal relationship between Variables can't always be determined
- Use of convenient sampling technique may limit this study not to generalize towards source population
- The limitations of this study include the relatively small sample size and the limited hospitals, in which it was conducted, this being constrained by the time and resources available.
- The study is limited to ICU nurses working in the five selected hospitals.

CONCLUSION AND RECOMMANDATIONS

6.1. Conclusion

This study revealed that nurses had adequate level of knowledge (60.7%) and practice (53.3%) towards the prevention of VAP. This study also revealed that nurses lacked knowledge and practice in some areas. Lacking of practice areas were: 3.3% washing their Hands before oral care, 10% before patient contact, 13.3% before suctioning, and 25% after patient contact, 20% wear sterile gloves during suctioning from ETT, and of the study subject 100% missed practicing hand washing before entering ICU, not discarding suction tube immediately after single use and no documentation of the procedures. And the knowledge gaps were: 36.8% knew that head of bed elevation ranged from 30 to 45 degree, 37.6% knew that prolonged use of stress ulcer prophylaxis may increase colonization density of aero digestive tract, 28.2% and 31.6% knew that closed suction system and change in humidifiers every 2-7days/when ever needed were recommended respectively.

Chi-square test reveals that only gender have a statistical significant association with practice $x^2(1) = 5.563$; p-value = 0.010 and also factors such as Age, work experience, Sex and educational level have a statistical significant association with knowledge with a Chi-square test $X^2(1) = 7.101$ (p - 0.008), $X^2(1) = 18.181$ (p-0.000), X2(1)= 5.156 (p- 0.023) and X2(1) = 4.175 (p- 0.041) respectively. The association between the two dependant variables is not determined; since, it is not stated in the objectives of the study and needs farther investigation and can be used as base line for future studies.

These findings indicated that most nurses had performed good practices and have an adequate knowledge level. However, it was also shown that 39.3% and 46.7%of subjects lacked performances as well as knowledge respectively. This indicated that a significant number of nurses in the current study areas have inadequate knowledge and practice; therefore, it is needed to provide update information and training to the nurses in these areas.

6.2. Recommendations

- ❖ Based on the results of this study, it is indicated that most ICU Nurses had performed good practices and knowledgeableso encouragement, motivation, training and also planning an incentives for their hard work might be an important issues to keep their knowledge and practice consistence.
- ❖ In this study, it is also indicated that problem of lacked practice and knowledge at some areas regarding prevention of VAP among nurses is identified. To improve the quality of care and the quality of life of patients suffering from VAP, the following implications and recommendations are offered.
- ➢ The results of the study display information of nurses' knowledge and practice regarding prevention of VAP in the selected hospitals. This information should be transferred to the Director of nursing services, and hospital administrators.
- ➢ All necessary facilities required to maintain sepsis and documentation sheets should be made available at all time.
- ➢ Education and training program would help improving the quality of nursing care [52].
- ➢ Hospital administrator shouldprovide effective prevention of VAP policy as an institutional goal by developing standard guidelines for prevention of VAP for staffs in ICUs [53].
- ➢ The findings from this study will be the bases or reference for further studies in the field of VAP.
- ➢ This study can be improved by increasing the sample size and ICU containing hospitals to enhance the generalizability.
- ➢ A replication of this study using observation method is recommended to examine the level of nurses' practice regarding prevention of VAP.
- ➢ Predictive study of factors related to nurses 'practice for prevention of VAP is recommended for future study.
- ➢ Findings of this study reinforce the need for further research to support the development and implementation of policies that will help improve patient outcomes, decrease length of stay and healthcare costs, and help ICU Nursesto strive for rendering affordable and effective healthcare.

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ANNEX - Questionnaire

I. Information Sheet

Information sheet and consent form prepared for nurses who will participated in research project, a cross-sectional ASSESMENT OF KNOWLEDGE AND PRACTICE OF NURSES WORKING IN THE ICU TOWARD PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA AT SELECTED GOVERNMENTAL HOSPITAL, ADDIS ABABA, ETHIOPIA,2015.

Name of Principal investigator: Behailu Aferu

Name of the organization: Addis Ababa University, College of Health Sciences, Department of Nursing and Midwifery

Name of the Sponsor: Addis Ababa University

This information sheet and consent form is prepared to explain the study you are being asked to join. Please read / listen carefully and ask any questions about the study before you agree to join. You may ask questions at any time after joining the study. The investigator is final year MSN graduate student from the department of nursing, college of health science, Addis Ababa University, and one advisor from Addis Ababa University.

Purpose of Research Project

Knowledge and practice toward prevention of VAP could be highly influenced by different factors that can lead to Poor quality of nursing care, disorganization of the service, conflicting roles, medication error, poor diseases prognosis, readmission, dissatisfaction with the care provided, and increased mortality. These problems are manageable if a nurse can properly implement preventive measure and practice. This study will identify how the knowledge and practice performed by nurses influence on the prevention of VAP in the selected governmental Hospital. The results of the study will be used as base line information to design appropriate intervention strategies.

Procedure

To assess the knowledge and practice of ICU nurses on prevention of ventilator associated pneumonia at selected hospitals Addis Ababa Ethiopia you are invited to take part in this project. If you are willing to participate in this project, you will sign the consent form. Then after, you will receive the questionnaire to give your response.

You do not need to write your name on the questionnaire and all your responses and the results obtained will be kept confidentially by using coding system whereby no one will have access to your response.

Risk/ Discomfort

By participating in this research project, you may feel that it has some discomfort especially on will take your time about 30 minutes. We hope you will participate in the study for the sake of the benefit of the research result. There is no risk in participating in this research project.

Benefits

If you participate in this research project, there may not be direct benefit to you but your participation is likely to help us in assessing knowledge and practice of ICU nurses on prevention of ventilator associated pneumonia among nurses for their inpatient. Ultimately, this will help us to identify the gap and take the appropriate intervention by the authorized stakeholder.

Incentives

You will not be provided any incentives or payment to take part in this project.

Confidentiality:

The information collected from this research project will be kept confidential and information about you that will be collected by this study will be stored in a file, without your name, but a code number assigned to it. In addition, it will not be revealed to anyone except the principal investigator and will be kept locked with key.

Right to refuse or withdraw:

You have full right to refuse from participating in this research. You can choose not to respond to some or all questions if you do not want to give your response. You have also the full right to withdraw from this study at any time you wish, without losing any of your right.

Persons to contact:

If you have any question to ask, please contact

Behailu Aferu

Tel: +251-923 29 37 12

Email = *fatbeh.a@gmail.com*

II. Consent form

I have read all the process and the objective of the study and I have understood the same as written that includes informed about the purpose, advantage, and disadvantage of this study titled assessment of ICU nurse toward the prevention of VAP in selected governmental hospitals**.** I also understood that the research imposes no risk and no composition would be provided to me and my family. I have been told that if I fill discomfort to respond to any of the question, I fill free to drop it any time I wish to do so. I have understood the information given and the participation is completely voluntary based. I have been told that my answers to the questions will not be given to anyone and not expect to write my name. Now I am giving my consent to participate in the study voluntarily.

Could I have your permission to continue?

1. Yes
2. No, Stop

Witness: Signature_____ Date _____

Data collector:

Name_____ Signature_____ Date_____

Result: 1. Questionnaire completed _____

2. Questionnaire partially completed _____
3. Participant refused _____
4. Others (please Specify) _____

Checked by Supervisor:

Name _____Supervisor's Signature _____Date _____

III. Questionnaire

Part I : Socio demographic characteristics of the respondent	
Question	**Response**
Sex	1. Male 2. Female
Age	_____years
Education status	1. Diploma 2. Degree 3. Master 4. Others specify_____
Year of experience	1. 6 month to ≤ 4 years 2. 5 to ≤9 years

Part II- ICU nurses knowledge about Prevention of Ventilator Associated Pneumonia.

Choose the best Answer

1. RecommendedEndotracheal routeof intubation

a. Oral intubation

b. Nasal intubation

c. Both routes

d. No recommendation

2.Recommended type of positioning for ventilated Patient (If there is no contraindication)

a. Supine positioning is recommended

b. Semi recumbent positioning is recommended

c. The position of the patient does not influence the risk for VAP

d. I do not know.

3.Advantage of Endotracheal tubes with extra lumen for drainage of sub-glottic secretions

a.reducing the risk for VAP

b. increasing the risk for VAP

c. Do not influence the risk for VAP

d. Increase the amount of secretions

4. factors contributing to bacterial colonization of the aero-digestive tract include-

a. Contaminated hand of health workers.

b. Contaminated respiratory therapy equipment.

c. Aspiration of contaminated secretion in to the lower airway.

d. all

5.A nurse is required to discard a suction catheter

a. immediately after a single use

b. can be cleaned and reused

c. can be used without being cleaned

d. Every 24 hours

6. Recommended Frequency of changing suction systems

a. Daily changes (or when clinically indicated)

b. Weekly changes (or when clinically indicated)

c. For every new patient (or when clinically indicated)

d. No need of changing

7.How often is recommended to change humidifiers

a. Every 2-7 days (or whenever necessary).

b. Every day (or whenever necessary).

c. Every month (or whenever necessary).

d. I do not know.

8.Suction catheter Insertion into the Endo-tracheal tube

a. Is a sterile procedure

b. Is a clean procedure

c. Can be a clean or a sterile procedure

d. I do not know.

9.Dusting of respiratory and bedside equipment with antiseptic should be done

a. Every shift and whenever soiled.

b. At time of patient discharge only.

c. Weekly.

d. Every other days

10. Recommended type of suction systems for intubated patients

a. Open suction systems

b. Closed suctions systems

c. Both systems

d. I do not know

11.Head of the bed elevation should be range from

a. 0-15 degree

b. 15-30 degrees.

c. 30-45 degrees.

d. Not recommended

12.A nurse caring a ventilated patient is required to wear sterile gloves during

a. Oral suctioning

b. ETT suctioning

c. Oral and ETT suctioning

d. I do not know.

13.A nurse caring a ventilated patient is required to wash hands

a. Before oral and ETT suctioning

b. After oral and ETT suctioning

c. Before and after oral / ETT suctioning

d. I don't know.

14.Ventilator Associated Pneumonia (VAP) comes from except

a. Community pneumonia

b. Contaminated ventilators

c. Other patients

d. Colonization the subsequent aspiration

15. Perform Oral care by using a swab moistened with mouth wash and water is recommended

a. once in a shift

b. every 4 to 6 hours

c. whenever necessary

d. Every other day

16.Prolonged use of Stress ulcer prophylaxis to a ventilated patient

a. Not to be used for patients who are at high risk of developing a stress ulcer.

b. May increase the colonization density of the aero digestive tract.

c. Routine stress ulcer prophylaxis does not influence the risk of VAP.

d. Decrease risk for VAP

17.Maintenance of a high nurse to patient ratio in the ICU is associated with

a. increased risk for VAP

b. decreased risk for VAP

c. does not influence the risk for VAP

d. I don't know

18.Educating ICU nurses on prevention of nosocomial infection helps to-

a. Increased rates of VAP

b. Decreased rates of VAP

c. Does not influence the rates VAP

d. Not needed

19. Recommended Frequency of ventilator circuit change is

a. every 48 hours (or when clinically indicated)

b. every week (or when clinically indicated)

c. every new patient (or when clinically indicated)

d. I do not know

20.Chest physiotherapy is recommended for ICU patients'

a. to reduce the risk for VAP

b. to increase the risk for VAP

c. to reduce increased temperature in ICU patients

d. I do not know

21.If you compare the Adjustable beds with the non-adjustable ones

a. Adjustable beds increase the risk of VAP

b. Adjustable beds reduce the risk of VAP

c. Both beds have no influence upon the risk of VAP

d. I don't know

22.Frequency of ETT suctioning should be done to patient

a. Routinely to every shift.

b. As needed.

c. Frequently

d. I do not know.

23.Early weaning of mechanical ventilator mode

a. reduces the risk for VAP

b. increases the risk for VAP

c. do not influence the risk for VAP

d. I don't know

24. Over feeding of ventilated patient may increase risk of aspiration leading to-

a. increased the risk for VAP

b. decreased the risk for VAP

c. do not influence the risk for VAP

d.No answer

25.ETT tube with well maintained pressure cuff for ventilator patient helps to

a. decrease the risk for VAP

b. increase the risk for VAP

c. Do not influence the risk for VAP

d. Not recommended

26.Unplanned extubation can increased risk of aspiration leading to

a. Increased the risk for VAP

b.Decreased the risk for VAP

c. Do not influence the risk for VAP

d. don't know

27. Principles of VAP Prevention includes-

a. Staff education

b. Colonization reduction

c. Aspiration avoidance

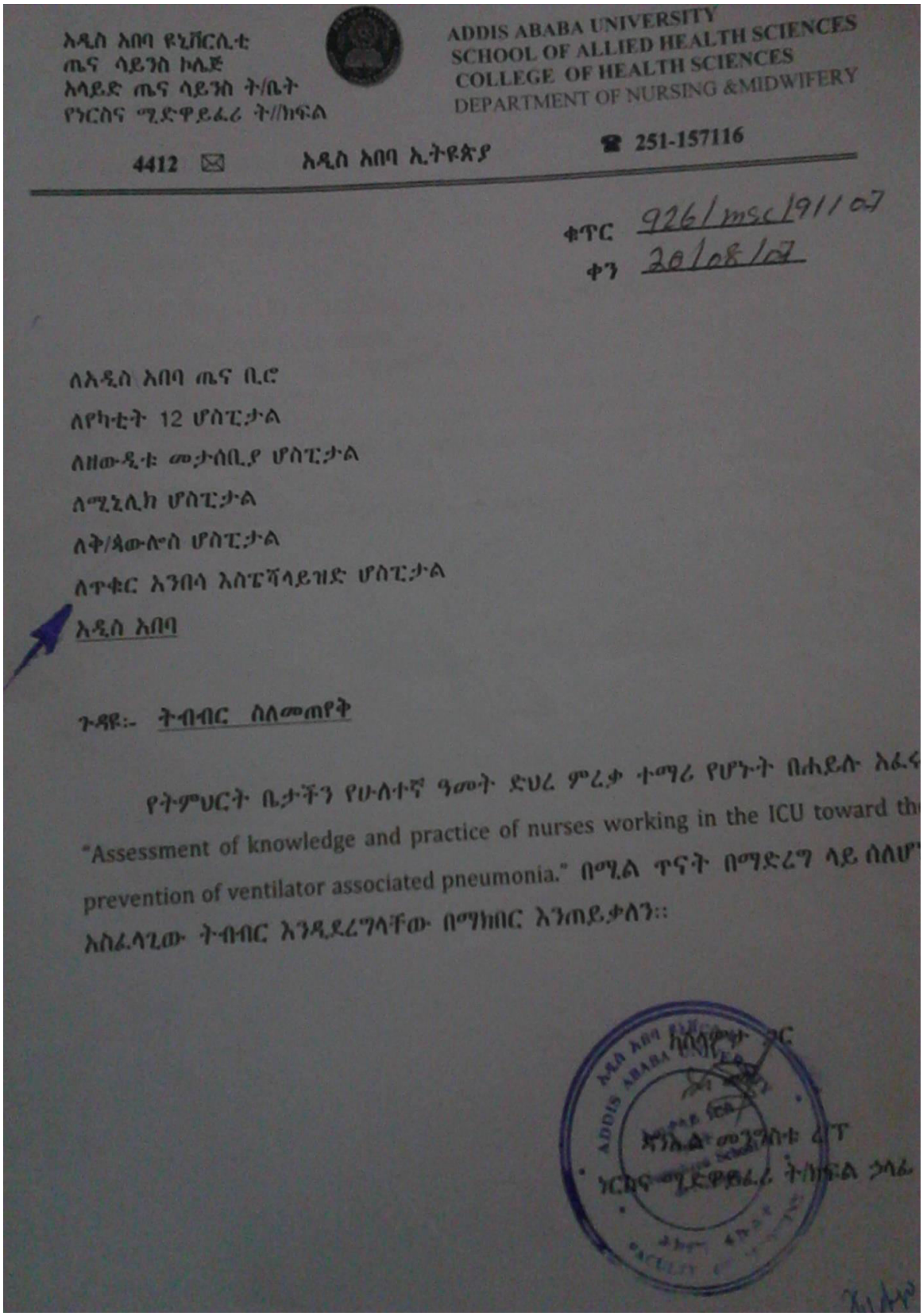
d. All

Thank you for your participation!!!

PART III Checklist

Part III- Observational check list for nurses ICU practice on Prevention of Ventilator Associated Pneumonia		
SEX: Female/ Male Age --------- **Education level: MSC**----- BSC----- Diploma---- Other……. **Work experience: A.** 6 month-≤4 yr ……**B.** 5 - ≤9 yr…….		
VAP PREVENTION PRACTICE	**YES**	**NO**
Hand washing practice		
Before entering the ICU		
Before contacting the patients		
After contacting the patients		
After contact with a source of microorganisms		
Use of alcohol hand rub		
Suctioning from the ETT/tracheotomy		
Hand washing before the procedure		
Prepare and use of sterile gloves for ETT suctioning		
Prepare sterile equipments required during suctioning		
Maintaining environmental cleanness		
Using aseptic technique in inserting the catheter into the ETT		
Discard suction tube immediately after one single use		
Hand washing after the procedure		
Documentation of the procedure		
Oral care practice		
Hand washing before giving oral care		
Use of clean gloves for oral care		
Position a patient in a semi recumbent		
Clean mouth using toothbrush or gauze moistened with mouth wash and water		
Rinse mouth with a clean swab		
Suction secretions as they accumulate (if necessary)		
Apply water soluble jelly to patients lips		
Clean used equipment and return it to its proper place		

Hand washing after oral care		
Documentation of the procedure		
TOTAL SCORE / 100%		



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ADDIS ABABA UNIVERSITY
SCHOOL OF ALLIED HEALTH SCIENCES
COLLEGE OF HEALTH SCIENCES
DEPARTMENT OF NURSING &MIDWIFERY

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Reference A/A/M/B/6266

Date 15/4/2015

ToYekatit 12 Hospital Medical college
Zewditu memorial Hospital
Minilik Hospital

Addis Ababa

Subject: Request to access Health Facilities to conduct approved research

This letter is to support **BEHAILU AFERU** to conduct research, which is entitled as "ASSESMENT OF KNOWLEDGE AND PRACTICE OF NURSES WORKING IN ICU TOWARD THE PREVENTION OF VENTILETOR ASSOCIATED PNEMONIA ". The study proposal was duly reviewed and approved by Addis Ababa Health Bureau IRB, and the principal investigator is informed with a copy of this letter to report any changes in the study procedures and submit an activity progress report to the Ethical Committee as required.

Therefore we request the mentioned HOSPITALS and staffs to provide support to the Principal investigator.

With Regards

Eyobed Kaleb
Ethical Clearance committee

Cc **BEHAILU AFERU**
Addis Ababa
To Ethical Clearance Committee
Addis Ababa

Date: 30/5/2015

Ref. No. pmas/117

Institutional Review Board (IRB) of St. Paul's Hospital Millennium Medical College (SPHHMC)

Ethical Clearance

Research Title: - Assessment of knowledge and practice of nurses working in the ICU toward the prevention of ventilator associated pneumonia

Principal Investigator: Behylu Aferu

The IRB of SPHMMC has reviewed the above mentioned research proposal and made the following decision:-

1. Approved:- ✓
2. Approved with recommendation:- _____
3. Approved on condition:-
4. Disapproved:- _____

The decision is valid for 12 months and the research should be conducted in compliance with the protocol/proposal approved by the IRB of SPHMMC. Any subsequent revision/amendment of the protocol/proposal needs approval before conduct of the research. The researcher should also submit written summaries of the research status to the IRB every 3 months. Upon the conclusion of the study, manuscripts and thesis work to the final/completed research project needs to be submitted to the IRB.

IRB Chair: Dr Birke Anbesse

Signature: _____

Date: May 18/ 2015

Cc:

- Vice Provost for Academic and Research
- IRB
- Behylu Aferu
  SPHMMC

ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF ALLIED HEALTH SCIENCES
DEPARTMENT OF NURSING AND MIDWIFERY

ASSESMENT OF KNOWLEDGE AND PRACTICE OF NURSES WORKING IN THE ICU TOWARDS PREVENTION OF VENTILATOR ASSOCIATED PNUMONIA AT SELECTED GOVERNMENTAL HOSPITALS ADDIS ABABA, ETHIOPIA 2015/16.

BY: BEHAILU AFERU (BSCN. MSCN Candidate)

ADVISOR: TIGESTU G/YOHANNES (RN, BSN, MSCN)

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JANUARY, 2016
ADDIS ABABA, ETHIOPIA

ASSESMENT OF KNOWLEDGE AND PRACTICE OF NURSES WORKING IN THE ICU TOWARDS PREVENTION OF VENTILATOR ASSOCIATED PNUMONIA AT SELECTED GOVERNMENTAL HOSPITALS ADDIS ABABA, ETHIOPIA2015/16.

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ADVISOR: TIGESTU G/YOHANNES (RN, BSN, MSCN)

A THESIS TO BE SUBMITTED TO SCHOOL OF GRADUATE STUDIES OF ADDIS ABABA UNIVERSITY, COLLEGE OF HEALTH SCIENCES, SCHOOL OF ALLIED HEALTH SCIENCES, DEPARTMENT OF NURSING AND MIDWIFERY FOR PARTIAL FULFILLMENT OF THE DEGREE OF MASTERS IN ADULT HEALTH NURSING

ADDIS ABABA, ETHIOPIA

JANUARY, 2016

APPROVED BY THE BOARD OF EXAMINERS

This thesis by **Behailu Aferu Filto** is accepted in its present form by the board of examiners as satisfying thesis requirement for the degree of Masters of Science in Adult Health Nursing.

Internal examiner

_____	_____	_____	_____
Full Name	Rank	Signature	Date

Research advisor

_____	_____	_____	_____
Full Name	Rank	Signature	Date

Addis Ababa, Ethiopia

January, 2016

DECLARATION

AND

COPY RIGHT

I Behailu Aferu , declare that this dissertation / thesis is my own original work and that it has been presented and will not be presented to any other university for a similar or any other degree award.

Signature …… Date ……

ACKNOWLEDGEMENT

I express my sincere gratitude and appreciation to my advisor **Ato Tigestu G/Yohannes** for his guidance and immeasurable support throughout this research.

To God for giving me the privilege of studying.

I extend my gratitude and thank you to the following people and institutions that made this study possible:

To **Ato Leoul Derbe** for his guidance and immeasurable support.

To my family who encouraged me when I thought I would never get finished. Their love and devotion will help me to finish my goal.

Special thanks to **Selamawit Molla** who has always been with me and encouraged me to fulfill my dreams.

To the five hospitals where this research conducted and the relevant personnel in these institutions.

To all nurses in the ICUs who participate in this study.

TABLE OF CONTENTS

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ABSTRACT

Background: The professional practice in a high risk critical care setting requires knowledge, skills, clinical experience and problem-solving abilities to assess monitor and effectively respond to the needs of critically ill patients. In addition, little is known regarding knowledge of nurses' working in the intensive care, concerning prevention guidelines and its application during the provision of patient care in the ICU. The Gaps between knowledge and actual clinical practice have not been sufficiently studied and needs further research which will contribute to the quality of care and improvement of critical patient's outcome.

Objective: this study aims to assess the knowledge and practice of nurses working in the ICU towards prevention of VAP at selected Hospital Addis Ababa, Ethiopia, 2015.

Methods: Study was conducted in five randomly selected governmental hospitals at Addis Ababa, Ethiopia. Descriptive cross sectional study design were employed on all 117 nurses working in the ICU in respected hospitals. **Data Analysis** Descriptive and inferential statistics were utilized to analyze the data. Descriptive statistics included frequency, percentage, mean and standard deviation. Chi square test was utilized to determine association of selected variables. Data were analyzed using SPSS version 200.

Results: The current study revealed that, Most of the studied sample 60.7% had satisfactory level of knowledge and 53.3% had Good level of practice regarding VAP prevention measures with a total mean score of (15.97 ± 3.23) and (15.47$\pm$2.029) respectively. Significant association was found in knowledge between participants with different education level as found (p = 0.0.041), age groups (p = 0.008), sex of participant (p=0.023) and between participants with different years of ICU working experience (p< 0.001). No significant association was found regarding nurses' practice (p=>0.05) except sex was found (p-0.010).

Conclusion and recommendation: Most Nurses work in critical care unit of the five hospitals are knowledgeable and have good practical performance regarding prevention of VAP, However, significant number of nurses 39% and 47% lacked knowledge and practice respectively. So updating knowledge and practice of nurses through Education and training would help to improving the quality of nursing care and also keep nurse's knowledge and practice consistence.

Key Words: Knowledge, Practices, Intensive care unit

Acronyms

AAU- Addis Ababa University

AGNB-Aerobic Gram negative bacteria

BSC- Bachelor of Science

CAP-community-acquired Pneumonia

CAUTI-catheter-associated urinary tract infections

CDC-center of communicable disease control

CI –Confidence interval

CLABSI-central line–associated bloodstream infections

DRC-Departmental review committee

EBGs-evidence-based guidelines

ETB-Ethiopian Birr

FMOH– Federal Ministry of Health

HCAP-healthcare associated pneumonia

HCUs-high-care units

HDUs -high-density units

ICU= Intensive Care Unit

LTACH- long-term acute care hospital

MRSA-methicillin-resistant Staphylococcus aureus

MSC- Master of science

MV-mechanical ventilation

PI –Principal Investigator

SPSS-Statistical Package for the Social Sciences

SSI-surgical site infections

VAP-ventilator-associated pneumonia

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INTRODUCTION

1.1 Background

Hospital acquired infections (HAIs), defined as infections acquired during the patients' stay in hospitals, constitute a major worldwide public health problem despite advances in our understanding and control of these infections (1). Over 1.4 million people worldwide suffer from HAIs with 5- 10% of patients admitted to modern hospitals in the developed world acquiring one or more of these infections. The risk of HAI in developing countries is 2- 20 times higher than in developed countries (2).The magnitude of the problem in terms of expenditure and human suffering being enormous. Ventilator-associated pneumonia (VAP) is defined as pneumonia that occurs 48-72 hours or thereafter following endotracheal intubation, characterized by the presences of a new or progressive infiltrate, signs of systemic infection (fever, altered white blood cell count), changes in sputum characteristics, and detection of a causative agent (3).

The prevalence rates of VAP ranging from 10% to 70% in critical care units (4).nosocomial infections mostly VAP are more common complications of care provided in ICU.The ICU mortality rate of infected patients was 25%, two times more than that for non-infected patients in an international study (5).Hospital-acquired pneumonia (HAP) is a pulmonary infection that develops in patients hospitalized for more than 48 hours, either in the ICU or in other wards (6, 7). Ventilator-associated pneumonia (VAP), a subset of HAP that occurs in mechanically ventilated patients, is the most frequent ventilator-associated complications (6, 7). HAP/VAP represents a major cause of deaths, morbidity and resources utilization in hospitalized patients, most notably in those with severe underlying conditions, Although VAP is generally a severe illness, with the patient treated in the intensive care unit (ICU), non-intubated patients with HAP can have either mild or more severe pneumonia.(6, 8-12).

VAP is most common nosocomial infection in the intensive care unit (ICU) with an incidence ranging from 8 to 28% in intubated mechanically ventilated patients (13,14).It is the second most common nosocomial infection in the intensive care unit (ICU) and the most common in mechanically ventilated patients (15, 16).

1.2 Statement of the Problem

Patients in intensive care units (ICUs) are a significant subgroup of all hospitalized patients, accounting for about 25% of all hospital infections. The prevalence of ICU acquired infections is significantly higher in developing countries than in industrialized countries, varying between 4.4% and 88.9%. Furthermore, device associated infection rates in developing countries, especially ventilator associated pneumonia (VAP) followed by central venous catheter related bloodstream infections (CRBSIs), occur at a higher frequency than in European countries and USA (17–19). The major problems associated with increased nosocomial infections in these countries are low compliance of hand hygiene, excessive number of patients and workload, inadequate staff and personal protective equipment, and late establishment of infection control programs (20). Increasing drug resistance and the spreading of multi drug resistant (MDR) pathogens in the ICU environment, results in limited therapeutic options and prolonged hospitalization. Consequently, ICU acquired infections have been associated with significant morbidity, mortality and rising healthcare costs in developing countries with limited resources (21).

Perhaps the most concerning aspect of VAP is the high rate of associated mortality. Hospital mortality of ventilated patients who develop VAP is 46% compared to 32% for ventilated patients who do not develop VAP. The professional practice in a high risk critical care setting requires specialized knowledge, advanced skills, clinical experience and problem-solving abilities to assess monitor and effectively respond to the needs of critically ill patients. In addition, critical care nurses' knowledge of adherence to and practice toward evidence-based guidelines (EBGs) to prevent VAP has been inadequate. Gaps between knowledge and actual clinical practice have not been sufficiently studied and needs further research which will contribute to the quality of care and improvement of critical patient's outcome. Therefore it is important to evaluate intensive care nurse's knowledge and practice to highlight possible contributors and barriers to the implementation of preventive measure on prevention of ventilator associated pneumonia, which is what this study is aiming to achieve.

1.3 Significance of the study

Pneumonia rates are much higher in mechanically ventilated patients due to the artificial airway, which increases the opportunity for aspiration and colonization. VAP is the leading cause of nosocomial infection in the ICU. For critically ill and postoperative patients receiving mechanical ventilation, VAP is a significant cause of morbidity and mortality. Patients with VAP have significantly longer duration of mechanical ventilation and ICU stay.(22; 23.)

To ensure the highest standards of nursing care, nursing practice must be based on a strong body of scientific knowledge. This can be achieved through adherence to the evidence based guidelines for prevention of ventilator associated pneumonia, ultimately improving patient's outcomes. Improved outcomes will shorten patient's ICU length of stay, hospitalization as well as benefit the patient financially with decreased hospital costs. Hospitals also gain benefits as they are continually faced with the challenge of providing cost effective services to patients and communities. . As VAP is linked with higher morbidity, mortality and costs, preventing ventilated patients from developing VAP is an important patient safety objective. VAP is thought to be a common complication of the acute respiratory distress syndrome, and the significant burden of VAP justifies the implementation of specific preventive strategies.

This study is meant to contribute in creating awareness of the prevention and control of VAP among ICU nurses.

1.4 Research questions

1. What is the knowledge of nurses working in the intensive care unit about the prevention of VAP in ICU?
2. What is the practice of nurse working in the ICU about the prevention of VAP?

LITERATURE REVIEW

This chapter begins with providing an insight about pneumonia specially the ventilator associated pneumonia and its Incidence and consequences. Literature review on VAP will also be addressed.

Pneumonia is classified as community-acquired (CAP), healthcare-associated (HCAP), HAP, or VAP. VAP is a sub-classification of HAP, in hospitalized and mechanically ventilated patients. CAP is defined as pneumonia for which the first positive bacterial culture is obtained within 48 hours of admission to the hospital and the patient does not have risk factors for HAP. Risk factors that are associated with health care associated pneumonia involves: when admission source indicates a transfer from another healthcare facility; patient has received hemodialysis, wound, or infusion therapy as an outpatient; patient was previously hospitalized for at least 3 days within the past 90 days prior to current admission; or the patient is immune compromised due to underlying disease or therapy (HIV, chemotherapy) (24).

Pneumonia represents the host's inflammatory response to the microbial invasion of the normally sterile lung parenchyma. The magnitude of this response depends on the size and type of the inoculum, the virulence of the organisms involved, and the competence of the host's immune system.

Patients in intensive care units (ICUs) accounting for about 25% of all hospital infections. The prevalence of ICU-acquired infections is significantly higher in developing countries than in industrialized countries, varying between 4.4% and 88.9%. Furthermore, device-associated infection rates in developing countries, especially ventilator-associated pneumonia (VAP) followed by central venous catheter-related bloodstream infections (CRBSIs), occur at a higher frequency than in European countries and USA(25,26,27).The major problems associated with increased nosocomial infections in these countries are low compliance of hand hygiene, excessive number of patients and workload, inadequate staff and personal protective equipment's and late establishment of infection control programs(28).

A prospective observational cohort study done in Nepal of 69 patients who were mechanically ventilated for more than 48 hours were evaluated to find out the development of nosocomial pneumonia and presence or absence of risk factors. The result showed that Twenty two (31.88%) out of 69 patients developed ventilator associated pneumonia, majority of them between four days to 14 days. Re-intubation, invasive lines, H2 blockers and low PaO2/FiO2 were identified as major risk factors in the study. Enteral feeding via nasogastric tube and use of steroids was not associated with development of ventilator associated pneumonia. The patients with ventilator associated pneumonia had significantly longer duration of mechanical ventilation (18.88±7.7 days Vs 7.36±4.19 days) and stay (29±17.8 days vs 9.22±5.14 days). The morality was similar for both the groups with or without ventilator associated pneumonia (29).

Research conducted in the ICUs of Europe demonstrated that VAP was the most frequent cause of nosocomial infection (2.1% or 13.9 episodes/1000 days of mechanical ventilation (MV)(30) , especially in France, where the rate was 16, 9 episodes/1000 days of MV(31). In the United States of America, this was the second most common cause in 2006, reaching 27% of critical condition patients(32)and in Brazil, 18.8% of customers developed VAP (58.2 episodes/1000 days of MV)(33).

The rates of bed side infection (BSI) in neonates are 3-20 times higher in developing countries, and, in some countries, approximately half of the patients in neonatal ICUs acquire an infection, and case fatality rates may reach 52%. The rates of VAP vary from 10 to 41.7 per 1000 ventilator-days with increased ICU LOS (34).

A study conducted in the United States of America in 2000, to assess tracheal colonization within 24 hours of intubation indicates that the pathogenesis of VAP usually requires two important processes that is, bacterial colonization of the aero-digestive tract and aspiration of contaminated secretions into the lower airway. The incidence of VAP was found to be 26 %, Andthe microorganisms involved were *Staphylococcusaureus*(44%),*Heamophilusinfluenzae*(31 %), *Streptococcus pneumonia* (12 %), and gram-negative bacilli (13 %). A multivariate logistic regression analysis showed that the tracheal colonization by *Staphylococcus aureus*, *Haemophilus influenza* or *Streptococcus pneumonia* within 24 hours of intubation was an independent risk factor for developing VAP (35).

Based on the onset, VAP can be divided into early and late. Early onset VAP occurs 48 to 96 hours after intubation and is associated with antibiotic-susceptible organisms. Late-onset VAP occurs more than 96 hours after intubation and is associated with antibiotic resistant organisms such as *Pseudomonas aeruginosa*, *methicillin-resistant Staphylococcus aureus*(MRSA),*Acinetobacter*species, and *Enterobacter* species. The latter type of VAP is accompanied by powerful pathogens and consequently has high mortality.

VAP is described as the most common nosocomial infection of intensive care unit (36-38)and is often fatal, although attributable mortality varies. The incidence differs between units (ICUs, HCUs (high-care units) and HDUs (high-density units)), hospitals (public and private sector) and countries (developed and developing). The range varies from 9% to 27% in Europe and America (36,37,39) Mortality rates in patients with VAP range from 20% to50% and may be as high as 70% when the infection is caused by multi-drug resistant, invasive pathogens . VAP attributable mortality is difficult to quantify because of confounding effects of associated conditions, but has been estimated to increase mortality by 30% and even twofold in critically ill patients (39, 40). Making' a timely and accurate diagnosis of VAP is critical as delayed administration of appropriate antibiotics increases mortality (36). And inappropriate use of antibiotics increases cost, incurs the risk of adverse drug reactions, and selects for resistant microbial flora that increase morbidity and mortality (36).

A narrative and systematic review analysis studies in Egyptian University Hospitals shows that Most of the 37 studies on which analysis were done were concerned with the risk factors, causative organisms, and incidence. The most common risk factors were leukopenia, thrombocytopenia, high CRP, metabolic acidosis, nasal endotracheal intubation, re-intubation, prior antibiotic use, and contaminated ICU environment with lack of infection control measures, use of antacids and H2 blocker, corticosteroids use, and coma. The most common causative organisms were Pseudomonas aerogenosa, Klebsiella, Escherichia coli, Staphylococcus aureus, Acinetobacter, Candida and Proteus.(41).

An Academic dissertation which was presented in Finland showed that critical care nurses' knowledge of evidence-based protocols and guidelines for avoiding complications associated with intubation and mechanical ventilation was shown to be limited: the mean knowledge score in the baseline measurement was 54.4% of total score. Thirty percent of the critical care nurses failed to achieve a mean score of 50%. These results are in line with

previous international cross-sectional surveys, which established that there was a lack of knowledge and a need for continuing education .In addition, this study confirms that critical care nurses' skills in adhering to evidence-based protocols and guidelines for avoiding complications associated with intubation and mechanical ventilation are currently limited: the mean skills score in the baseline measurement was 47.8% of total score. Seventy three per-cents of the critical care nurses failed to achieve a mean score of 50%. In addition, the quality of observed pra6ctices prior to, during and post ETS events were significantly lower than the recommended care: the mean skills score ranged from 54.9% (Study I) to 60.8% (Study IV), which is in line with several previous studies(42).

A descriptive cross-sectional study carried out in 37 ICUs of 23 hospitals in Sana'a city, Yemen indicates The nurses' knowledge scores ranged between 13.3% and 80% with a total mean score of 47.32 ± 13.6% (7.1 ± 2.03 on 15 items) knowledge of evidence-based strategies for preventing VAP is low among the majority of nurses working in Yemen ICUs (73.4% of nurses scored <60%). This low score reflects the fact that Yemen ICUs are staffed with general trained, diploma holder nurses, the lack of in-service training, and the absence of consistent policies in ICUs. Holding a bachelor degree in nursing and acquisition of a short course in respiratory therapy was shown to be associated with better knowledge scores. These results stress the need of hospitals to organize and implement in-service educational programs for infection prevention in general, and for VAP prevention in particular, for all staff involved in the care of the mechanically ventilated patients. The ICUs should develop and review their policies and procedures (if they have) to include the current EBGs for VAP prevention. For nursing schools and colleges, the curriculum of the basic nursing programs should be modified to include the most recent EBGs for VAP prevention (43).

Retrospective study done America at long-term acute care hospital During the 22-month study period (April 1, 2006–January 31, 2008) showed that there were 157 long-term acute care hospital (LTACH)admissions involving 88 patients who required mechanical ventilation (some patients were admitted on more than 1 occasion). A total of 23 CDC defined cases of VAP occurred in 19 patients during 13,746 ventilator-days. The cumulative VAP incidence was 14.6% (23 of 157 admissions), and the incidence rate was 1.67 cases per 1,000 ventilator-days, which was a 56% reduction from the VAP rate of 3.8 cases per 1,000 ventilator-days before the implementation of a VAP-bundle approach (relative risk, 0.44 [95% confidence interval, 0.27–0.70]; *P=0.*001). The VAP rate in the LTACH is lower than the VAP rate reported in acute care hospitals. Cases of VAP in the LTACH were frequently

polymicrobial and were associated with multidrug-resistant pathogens and increased length of stay. The guidelines from the Centers for Disease Control and Prevention that are aimed at reducing cases of VAP appear to be effective if applied in the LTACH setting (44).

A quasi-experimental study conducted in an ICU of a large teaching hospital in Malaysia indicates that Nurse-led education significantly increased nurses' knowledge of ($t[70] = -36.19$; $p < 0.001$) and compliance with ($t[65] = -21.41$; $p < 0.001$) ventilator care bundle VCB practices. The incidence of VAP, which was 39 per 1,000 ventilator days during the two-month period before intervention, dropped to 15 per 1,000 ventilator days during the two-month period following intervention (45).

Summary of literature review

Hospital acquired infections (HAIs), defined as infections acquired during the patients' stay in hospitals, constitute a major worldwide public health problem despite advances in our understanding and control of these infections [1]. Over 1.4 million people worldwide suffer from HAIs with 5- 10% of patients admitted to modern hospitals in the developed world acquiring one or more of these infections. The risk of HAI in developing countries is 2- 20 times higher than in developed countries [2].The magnitude of the problem in terms of expenditure and human suffering being enormous.

Ventilator associated pneumonia (VAP) are the most common complications and cause substantial morbidity, mortality, and increases expense for treatments for mechanically ventilated patients. VAP was also the second most common nosocomial infection in the intensive care unit (ICU) and the most common in mechanically ventilated patients [15, 16]. Multiple risk factors influence the development of VAP. In the prevention of VAP, Nurses, working in the ICUs has to play a leading role in taking initiatives that aimed to ensure quality of care and thus to enhance patient safety which includes prevention of VAP. However, a significant number of studies indicated that most nurses lacked the required knowledge about prevention of VAP and the majority of them did not practice properly.

Many factors influence nurses' knowledge and practice, such as age, gender, years of working experience, and education. Based on a literature review, it was found that level of nurses' knowledge and practices regarding prevention of VAP were not congruent and also its relationship was still inconsistent.

Despite the availability of some studies in the developed countries, studies investigating level of nurses' knowledge and practices regarding prevention of VAP, particularly in Sub-Saharan Africa are very limited, And those available have different designs and inconsistent results , especially in Ethiopia there is no any published local literature which show the magnitude of the problem. Further investigation is needed as most studies have focused on nurses' knowledge rather than both knowledge and practice. Therefore, this study was aimed at assessing knowledge and practice of nurses working in the ICU towards prevention of VAP at selected governmental Hospital Addis Ababa, Ethiopia, 2015

2.1 Conceptual framework of the study

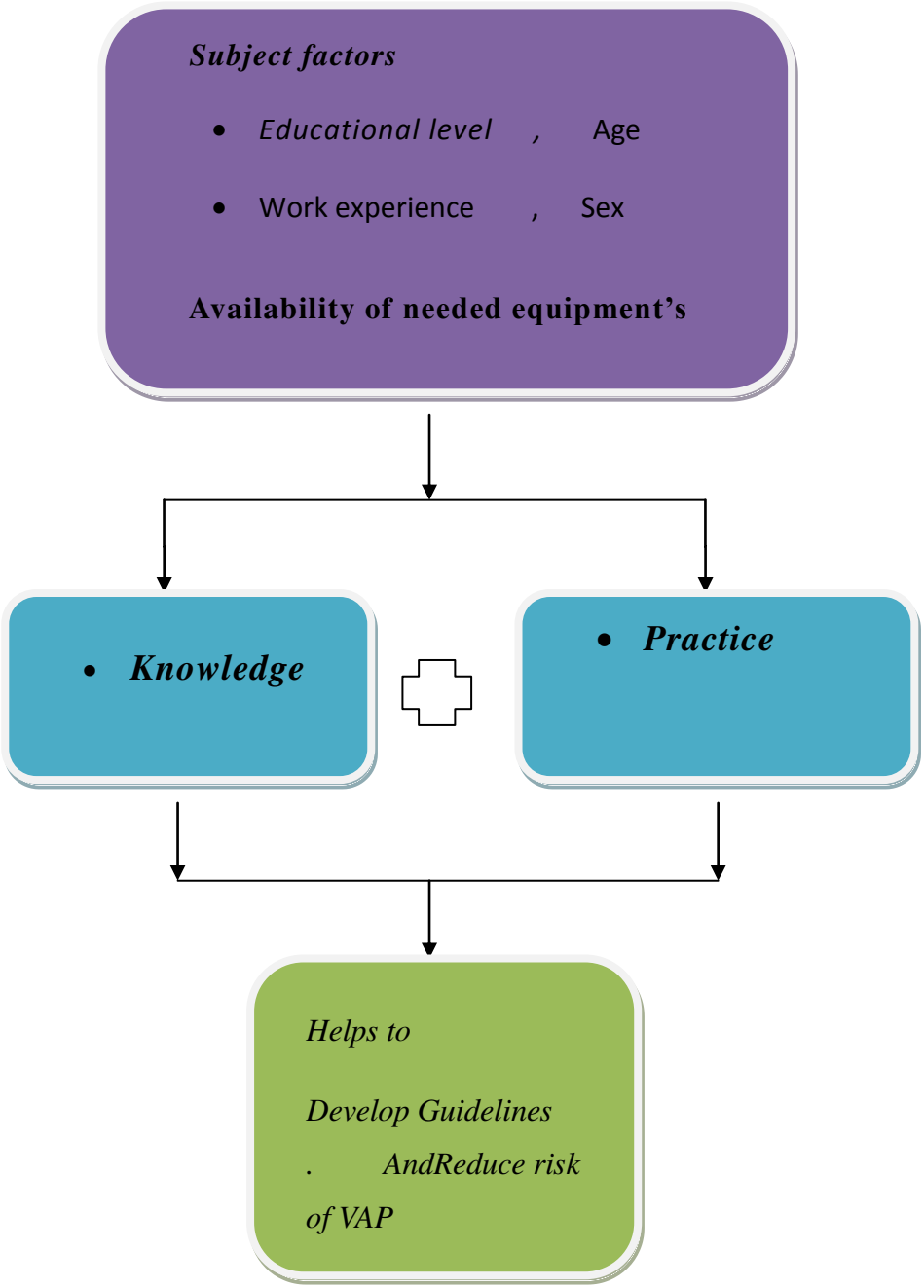

Figure 1 Conceptual framework on prevention of VAP and its associated factors . By nurses at selected public hospitals, Addis Ababa, Ethiopia, 2015.

This conceptual framework is designed by PI.

3. Objectives

3.1. General objective

- To assess the knowledge and practice of nurses working in the ICU towards prevention of VAP at selected governmental Hospital Addis Ababa, Ethiopia, 2015.

3.2. Specific objectives

- To determine the existing knowledge of nurses' working in intensive care units towards prevention of ventilator associated pneumonia (VAP) at selected governmental hospitals in Addis Ababa, Ethiopia, 2015.
- To determine the existing practice of nurses' working in intensive care units towards prevention of ventilator associated pneumonia (VAP) at selected governmental hospitals in Addis Ababa, Ethiopia, 2015.
- To determine the association between the dependent variable with independent variables such as Socio-demographic characteristics, Educational level and years of experience.

4. Methodology

4.1. Study area

Addis Ababa, capital of Ethiopia, is situated at the heartland of Ethiopia, with a population of 3,384,569 in an area of 540 square kilometers. The city comprises 6 zones and 28 woredas. The population pyramid is broad based, typical of a developing world. People from different regions of Ethiopia populate the city; the main causes of morbidity and mortality are communicable diseases that could be prevented through interaction of primary health care activities. The city consists of a total of 79 health facilities including Hospitals; out of which 5 hospitals owned by Addis Ababa Health Bureau ,4 hospitals owned by Federal MOH (Central), 1 Addis Ababa University 2 Ministry of defense , 1 police force hospitals which provide different health services. In addition there are about 23 health center, 9 clinic, and 34 health posts. Among 13 public Hospitals TikurAnbessa, St.paulos, Yekatit12, Zewditu and Minilik the II conveniently selected because they have an ICU. The study conducted in these five intensive care units at Addis Ababa selected governmental hospitals

4.2. Study period

The study was conducted in five selected governmental hospitals Addis Ababa from March 2015 to July2015.

4.3. Study design

The study design was conducted using quantitative and qualitative descriptive cross-sectional study design. This study design is relevant because cross sectional studies provide advantage for single time or a snapshoot data gathering with regard to the time allocated for the study to be accomplished.

4.4. Source population

Nurses working in the selected governmental hospitals ICU at Addis Ababa, Ethiopia.

4.5. Study population

All nurses working in the five selected governmental hospital ICUs during the data collection period.

4.6. Eligibility criteria

4.6.1. Inclusion criteria

- Nurses working in intensive care units for at least 6 month or more and who volunteer to participate in this study during the study period were included.

4.6.2. Exclusion criteria

- Nurses who refuse to participate in this study.
- Nurses with less than 6 months of work experience.

4.7. Sample size

The actual sample size for the study is fixed by the formula of single population proportion formula for single proportion population.

$$n = \frac{(Z_{\alpha/2})^2 \, p \, (1-p)}{d^2}$$

Where, z – confidence interval corresponding to 95% (1.96)

P – Prevalence rate 50% 1+ni/N1+384/149

n – Minimum sample size our sample size is then,

$$n = \frac{Z^2 P(1-P)}{d^2} = \frac{(1.96)^2 x 0.50(1-0.50)}{(0.05)^2} = 384$$

Since the total number of nurse working in ICU of selected hospitals is N= 149 which is less than 10, 000, a finite population correction formula was applied.

Therefore, $n_f = \frac{n}{1+ni/N} = \frac{384}{1+384/149} = 107$ Where, ni – initial and nf – final sample size

To adjust for non response rate 10% of the calculated sample size added to the n therefore n= 117 nurses hence the minimum sample size required for this study was 117 nurses.

4.8. Sampling technique and procedures

A total of 28 hospitals was identified in Addis Ababa city, of those 28, thirteen were governmental, four of which owned by federal ministry of health, five by Addis Ababa regional health bureau , one owned by Addis Ababa University ,two by Ministry of defense and one owned by the Federal police force. All 13 governmental hospitals were listed, and five hospitals (Black lion, St.Paulos, Minilic II, Zewditu and Yekatit 12 hospitals) were selected using simple random selection method. Study subjects were included conveniently based on proportional allocation of the hospitals (fig 2).

Proportional to size allocation formula = $\frac{n_i * n_f}{N}$

Where n_i - number of nurse in hospital n_f - final sample of the study N-total number of nurse in the selected hospitals

- TkurAnbesa hospital = $\frac{49*117}{149} = 38$
- Zewditu hospital= $\frac{33*117}{149} = 25.9 \sim 26$
- Minilik II hospital= $\frac{14*117}{149} = 10.9 \sim 11$
- Yekatit 12 hospital= $\frac{11*117}{149} = 8.6 \sim 9$
- St.Paulos hospital= $\frac{42*117}{149} = 32.9 \sim 33$

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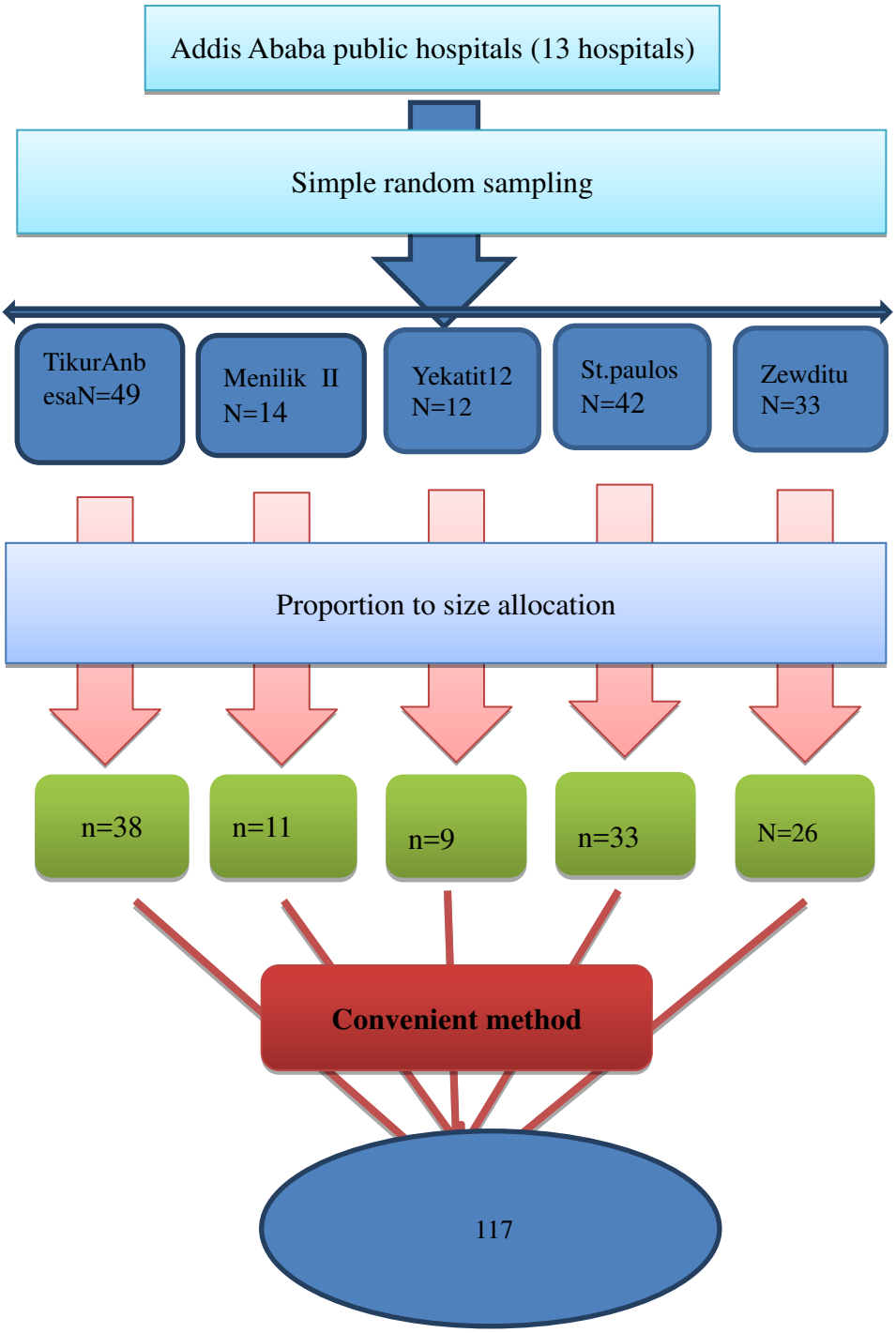

Figure: 2- A schematic representation of sampling method

4.9 Variables

4.9.1 Dependent variable

- *Knowledge*
- *Practice*

4.9.2. Independent variables

- ***Socio demographic characteristics***
    - Age
    - Sex
    - Educational level
- Year of work experience

Operational definitions

1. Knowledge, - **I**n this study it refers to the correct level of response of the subject regarding the prevention of ventilator associated pneumonia elicited through structured questionnaire participants who selected a correct choice from a certain item and above mean score value were considered to be knowledgeable.

2. Practice, - In this study it refers to the nursing actions done by the nurses on the subject regarding the prevention of ventilator associated pneumonia such as hand washing, suctioning from the ETT/tracheotomy and oral care, Participants who adhere to accepted ICU nurse practice to prevent VAP and above mean score value were considered to have good practice on that item.

3. Year of experience, -In this study it refers to the time duration of the nurses working in the ICU which is categorized in to 6 month to $\leq$4 year and 5 to $\leq$9 years.

4.Educational level, - In this study it refers to the educational level which the nurse currently have , which is categorized in to Diploma ,BSC , MSC and Other.

4.11 Data collection tools and process

A structured Self-administered questionnaire and observational checklist were used to assess the knowledge and practice of nurses working in the intensive care units. Both instruments were designed by the principal investigator as it appears in the literature review [48, 54].

1. For structured questioners Data collection was conducted by the trained data collectors and the supervisor. The structured self-administered instrument involves questions that assess Socio-demographic characteristics and knowledge of nurses at the ICU.
2. An observation checklist designed by Principal investigator was used to assess the actual nurses' practice. The observation was conducted by Principal investigator and another trained data collector. Nurse attending mechanically ventilated patients were observed conveniently during the three shifts for at list 3 hours during the data collection period. Four data collectors and one supervisor were recruited based on previous experience data collection. Training was given to data collectors and supervisors for one day.

Pre –test :- Both the structured self-administered questionnaires and the check list were pre tested for its clarity and to test what it is intended to test. Question that has problems of clarity was amended before the actual data collection period .pre-tested subject were excluded from the actual data collection.

4.12. Data quality control

During data collection principal investigator checked data for its completeness and missing information at each point. To ensure accuracy, Validity of the self-administered questionnaire and the standard observational checklists guide for the assessment was adopt and edited by my supervisor, pre-test was done the questionnaire was pre tested for the relevance of dependent and independent variables to avoid any confusion during actual data collection period. The principal investigator checked nurse's response one week prior to the actual data collection. This was helpful for the investigator to screen out vague questions and modify some of the question item as soon as possible, Further more data were checked during entry into the computer before analysis and the incomplete data were discarded.

4.13. Data processing and analysis

Data gathered from study participants was cleaned, coded and entered in to computer.Incomplete responses were excluded in the analysis. Statistical package for Social Sciences (SPSS) version 20 was used for analysis and descriptivemethods such as frequencies, proportions, and Chi square tests used toanalyze the data. Results were presented in frequency tables and graphs.

4.14. Dissemination and utilization of the result

The result of this study disseminated to Addis Ababa University, College of Health Sciences Department of Nursing and Midwifery. A copy of the results submitted to the studied hospitals. The result presented in local and International conferences and sent for publication in scientific journals.

4.15. Ethical consideration

Ethical clearance sought from the Departmental review committee of Department of Nursing and Midwifery, College of Health Science, Addis Ababa University. Letter of permission was obtained from Medical Directors of the study settings before the actual data collection period. Permission letter provided to respective head nurses of the study units. Information was given to study participants about the purpose and procedure of study and they were observed, informed consent was obtained and confidentiality and privacy was ensured.

5.1 Results

A total of 117 nurses working from randomly selected five hospitals were included in the study. The response rate of the study participants was 100%. Sex characteristics of the study participant were, 66 (56.4%) female with the remaining 51 (43.6%) male. Of those 117 participants, majority 80 (68.4%) were aged between 23 and 27, and 37 (31.6%) between 28 and 32 with mean and SD of 26.23 $\pm$ 2.73, and median value is 26 (Min=23: Max=32). Concerning their work experience in ICUs 63 (53.8%) of the respondents had ICU experience of 6 months to 4 years and 54 (46.2%) had 5 to 9 years of work experience. With regard to the educational level of the nurses, majority 101 (86.3%) were graduated in Bachelor of Science in nursing and the remaining 16 (13.7%) were Diploma graduates as indicated in table 1.

Table1. Socio-demographic characteristics of nurses working in selected governmental hospitals ICUs in Addis Ababa (2015) (N=117)

Variables	Frequency(N)	Percent (%)
Total sample	117	100
Gender		
Male	51	43.6
Female	66	56.4
Age		
23-27	80	68.4
28-32	37	31.6
Mean +SD = 26.23$\pm$2.727 Median =26 (Min = 23 : Max =32)		
level of education		
Diploma	16	13.7
Degree	101	86.3
Work experience		
6months-4yrs	63	53.8
5yrs-9yrs	54	46.2

5.2 ICU Nurses knowledge concerning prevention of ventilator associated pneumonia in Addis Ababa selected governmental hospitals (2015)

Mean value was used to classify ICU nurses knowledge and practice about ventilator associated pneumonia. Nurses knowledge or practice score above the mean value (15.97) were taken as having adequate knowledge and those who score below the mean are considered as having poor level of knowledge or practice.

There were 27 knowledge related questions about the prevention of VAP and level of Knowledge of nurses was calculated out of 27. Accordingly the result showed that, 71 (60.7%) are knowledgeable on prevention of VAP whereas 46 (39.3%) are not knowledgeable about prevention of VAP in the ICU setting. The mean score and standard deviation of knowledge of nurses working in the ICUs, about prevention of VAP was 15.97 ± 3.23 with the minimum 5 and maximum 23. Minimal number of respondents 33 (28.2%) correctly answered items number 10 and 14 about Closed suctions systems are the recommended suction systems for intubated patients and Colonization of the subsequent aspiration is the cause of Ventilator Associated Pneumonia (VAP), while most 116 (99.1%) respondents correctly responded to item 18 which was about the need of educating ICU nurses about prevention of nosocomial infection.

Fig. 3 Level of knowledge of ICU nurses working in selected hospitals in Addis Ababa 2015

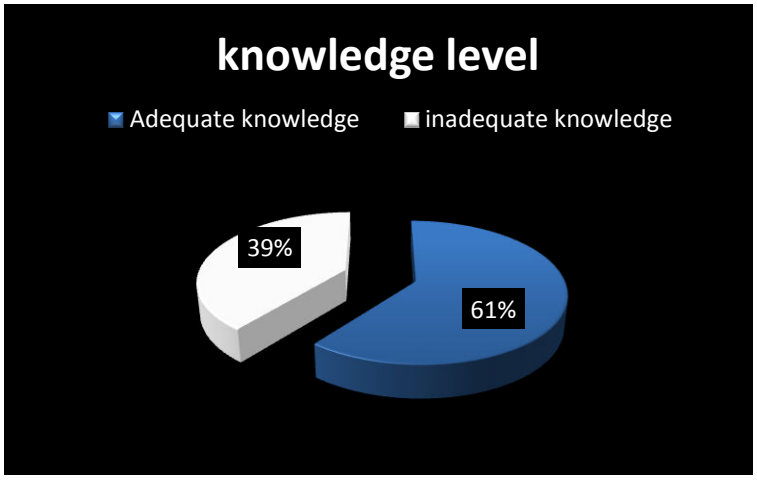

Table-2 Distribution of knowledge of ICU nurses working in selected hospitals in Addis Ababa towards the prevention of VAP, 2015

Items (questions) and correct answers	Frequency	Percent %
Recommended route of patient intubation is- Oral intubation	74	63.2
Recommended Patient positioning-Semi recumbent positioning	50	42.7
Endotracheal tubes with extra lumen for drainage of sub-glottic secretions ↓ risk for VAP	78	66.7
Factors contributing to bacterial colonization of the aero digestive tract include- Contaminated hand of health workers, respiratory therapy equipment and Aspiration of contaminated secretion in to the lower airway.	**106**	**90.6**
A nurse is required to discard a suction catheter Immediately after a single use	59	50.4
Frequency of change in suction systems every new patient (needed)	49	41.9
Frequency in changing humidifiers Every 2-7 days (if necessary)	37	31.6
Suction catheter Insertion into the ETT Is a sterile procedure	82	70.1
Dusting of respiratory and bedside equipment with antiseptic - Every shift and whenever soiled.	81	69.2
Recommended type of suction systems is Closed systems	**33**	**28.2**
Head of the bed elevation should be range from 30-45 degrees.	**43**	**36.8**
A nurse caring a ventilated patient is required to wear sterile gloves during ETT suctioning	**44**	**37.6**
A nurse caring a ventilated patient is required to wash hands Before and after oral / ETT suctioning	**103**	**88.0**
VAP comes from: Colonization of the subsequent aspiration	**33**	**28.2**
Oral care using a swab moistened with mouth wash and water - Every 4-6 hrs and when necessary	64	54.7
Prolonged use of Stress ulcer prophylaxis to a ventilated patient - May increase the colonization density of the aero digestive tract.	44	37.6
High nurse to patient ratio in ICU- increased risk for VAP	77	68.5
Educating ICU nurses on prevention of nosocomial infection helps to- ↓ rates of VAP	**116**	**99.1**
Frequency of ventilator circuit Replacement change -Every new patient (clinically indicated)	60	51.3
Chest physiotherapy for ICU patients' To reduce the risk for VAP	**97**	**82.9**
Adjustable beds Vs non-adjustable -Adjustable ↓ the risk of VAP	80	68.4
ETT suctioning should be done to patient. As needed.	107	91.5
Early weaning of mechanical ventilator mode Reduces risk of VAP	67	57.3
Over feeding of ventilated patient may ↑ risk of aspiration leading to- ↑ the risk for VAP	82	70.1
ETT with well maintained pressure cuff - decrease the risk for VAP	72	61.5
Unplanned extubation can↑ risk of aspiration lead to↑ risk of VAP	83	70.9
Principles of VAP Prevention -All(Staff education, Colonization reduction & Aspiration avoidance)	91	77.8

5.3 Association between knowledge of ICU nurses and independent variables in selected hospitals in Addis Ababa, 2015

As indicated in table 3 below Age has highly statistically significant association with knowledge. ICU nurses aged between 28 and 32 years had adequate knowledge compared to ICU nurses aged between23 and 27 years $X^2(1)$ =7.101 (p - 0.008). Similarly, work experience is highly significantly associated with knowledge $X^2(1)$ = 18.181 (p-0.000), ICU nurses with ICU work experience of five to nine years had adequate knowledge compared to ICU nurses with experience of 6 months to $\leq$ 5 years work experience. Sex and educational level were also associated with Knowledge, $X^2(1)$= 5.156 (p- 0.023) and $X^2(1)$ = 4.175 (p- 0.041) respectively. Female nurses working in the ICU had adequate knowledge compared to the male and nurses with educational level of Bachelor of Science had adequate knowledge compared to the Diploma holders.

Table3. Association between socio-demographic characteristics andknowledge of nurse's working in the ICU toward the prevention of VAP (N=117).

Variables	Level of knowledge Vs Socio-demographic		X^2	*Df*	P-value
	Adequate(n)	Inadequate(n)			
Age					
23-27years	42	38	7.101	1	**0.008***
28-32years	29	8			
Sex					
Male	25	26	5.156	1	**0.023***
Female	46	20			
Work experience					
6month to 4 years	27	36	18.181	1	**0.000***
5yr. to 9 years	44	10			
Educational level					
Diploma	6	10	4.175	1	**0.041***
Degree	65	36			

.* P< 0.05

5.4 ICU Nurses practice towards the prevention of ventilator associated pneumonia

A total of 60 nurses working from the randomly selected five hospitals were included in the study. Concerning sex characteristics of the study participants, 66.7% (40)were female with the remaining 33.3 %(20) male. Of those 60 participants, majority 71.7% (43) were aged between 23 and 27, and 28.3% (17) between 28 and 32 with mean and SD of 26.2±2.679, and median value is 26, (Min=23: Max=32). concerning to their work experience in ICUs 45 %(27) of the respondents had experience of 6 months to 4 years and 55% (33) had 5 to 9 years of work experience. With regard to the educational level of the nurses, majority 76.7 % (46) were graduated in Bachelor of since and the remaining 23.3% (14) were Diploma.

Throughout the period of the study, 60 observations of nurses on VAP prevention practices were conducted during the three shift period. There were an observation checklist about the prevention of VAP and levels of practice of nurses were evaluated based on the checklist. Mean value was used to classify ICU nurses practice ,a score above the mean value (15.47) were taken as having Good level of practice and those who score below the mean are considered as having poor level of practice. Accordingly the result showed that, 32 (53.3%) had Good performanceand 28 (46.7%) had inadequate or poor level of performance about prevention of VAP in the ICU setting. The mean score and standard deviation of practice of nurses were 15.47 ±2.029 with the minimum 12 and maximum 18. Based on the results presented in table4, which there were six items of practice that highest percentage of nurse's practiced they are: 58(96.7%) of observed participant wash Hand after contact with a source of microorganisms, 46 (76.7%) Use of alcohol rub as for hand washing, 51 (85%) Insuring environmental cleanness during suctioning, 48(80%) Insert the catheter into the ETT gently by using aseptic technique , 60(100%)Clean mouth using toothbrush or gauze moistened with mouth wash and Rinse with a clean swab and Suction secretions as they accumulate, if necessary.

And the table also showed that six Practice questions that the lowest Percentage of Nurses correctly practiced, of the sixty subjects 3.3%wash their Hand before giving an oral care, 6.7% Apply water soluble jelly to patients lips, 10% wash their Hand Before contacting thepatients, 13.3% Hand washing before suctioning, 20% Wear sterile gloves during suctioning from ETT, 25% wash their Hand after patient contact.

According to table4, the result revealed that concerning hand washing before entering ICUnone of the subjects were practiced correctly and participants were discard suction tube immediately after single use and also the subject missed practicing documentation of the procedures.

5.5 Practice of participants towards the prevention of VAP

The result showed that, 28 (46.7%) of the respondents are found to be inadequate or poor level of performance while the remaining 32 (53.3%) areGood level of performance about prevention of VAP in the ICU setting.

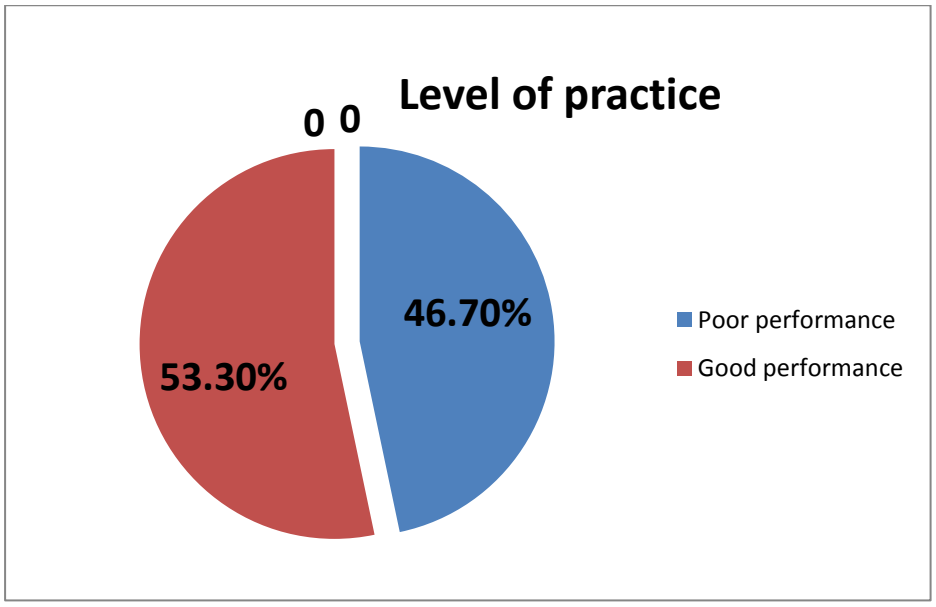

Figure 4: Level of practice of ICU nurses working in selected hospitals in Addis Ababa . 2015.

Table 4 Observed Hand washing, Suctioning and Oral care practice of nurses expressed in percentages and number values (N=60).

Hand washing	**Yes**	**No**
Hand washing before entering ICU	0(0%)	60(100%)
Before patient contact	12(20%)	48(80%)
After patient contact	14(23.3%)	46(76.7%)
After contact with a source of microorganisms	58(96.7%)	2(3.3%)
Use of alcohol rub	46(76.7%)	14(23.3%)
Suctioning from the ETT/tracheotomy		
Hand washing before the procedure	8(13.3%)	52(86.7%)
Use of sterile gloves for ETT suctioning	12 (20%)	48(80%)
Prepare sterile equipment required during suctioning	46(76.7%)	14(23.3%)
Maintaining environmental cleanness	51(85%)	9 (15%)
Use of aseptic technique in inserting the catheter into the ETT	48(80%)	12(20%)
Discard suction tube immediately after one single use	0(0%)	60(100%)
Hand washing after the procedure	2(3.3%)	58(96.7%)
Documentation of the procedure	0(0%)	60(100%)
Oral care		
Hand washing before giving oral care	2 (3.3%)	58(96.7%)
Use of clean gloves for oral care	60(100%)	0(0%)
Position a patient in a semi recumbent	54 (90%)	6(10%)
Clean mouth using toothbrush or gauze moistened with mouth wash	60(100%)	0(0%)
Rinse mouth with a clean swab	60(100%)	0(0%)
Suction secretions as they accumulate(if necessary)	60(100%)	0(0%)
Apply water soluble jelly to patients lips	4 (6.7%)	56 (93.3%)
Clean equipment and return it to its proper place	60(100%)	0(0%)
Hand washing after giving oral care	60(100%)	0(0%)
Documentation of the procedure	0(0%)	60(100%)

5.5. Association between practice and socio-demographic characteristics

Chi-square test reveals the following results; there were statistical significant association between genderand practice$x^2(1) = 5.563$; p-value = 0.010. Concerning age group, educational level, and work experience, the Chi-square value indicated that there were no statistical significant association with practice toward the prevention of VAP among nurses worked in ICU with a $x^2(1) = 0.375$; p-value = 0.540,$x^2(1) = 0.106$; p-value= 0.744,$x^2(1)$ =0.097; p-value =0.755 respectively (table5).

Table5. Association between socio-demographic characteristics and practice of nurse's working in the ICU toward the prevention of VAP (N=60).

Variables	Level of practice Vs Socio-demographic		X^2	*df*	P-value
	Good(n)	Poor(n)			
Age					
23-27years	24	19	0.375	1	0.540
28-32years	8	9			
Sex					
Male	6	14	6.563	1	**0.010***
Female	26	14			
Work experience					
6month to 4 years	15	12	0.097	1	0.755
5yr. to 9 years	17	16			
Educational level					
Diploma	8	6	0.106	1	0.744
Degree	24	22			

. * P< 0.05

DISCUSSION

The main objective of this study was to assess the knowledge and practice of nurses working in the ICUs towards prevention of VAP at selected governmental hospitals in Addis Ababa. Association between independent andoutcomevariables was also examined. The results of this study were based on the primary data gathered from nurses who had been working the fiveselected hospitalICUsin Addis Ababa. One hundred and seventeen participants were included conveniently for the self-administeredquestionnaireswhich assessed knowledge and 60 amongst the 117 participants were also conveniently observed for their practicetowards the prevention of VAP.

There were 27 Items containing self-administered questionnaires,andthe total score obtainable was 27. Participantswere considered having adequate knowledge when their score is above the mean value (15.97), and 23 items containing practice questions through observation checklist which evaluates practiceandParticipants were considered good practice when their score is above the mean value (15.47).

Nurses' Knowledge toward the Prevention of VAP

According to this study Majority (56.4%) were female critical care providers. It is believedthat the nursing profession is dominated by females. Among the participants, 68.4% belonged to the age group of 23-27 years, 86.3% were degree holder and 53.8% were 6month to 4years total workingexperience whichmight indicates that nurses were moved across wards and might not have adequate time to gain specific knowledge and practice in that areas or nurses might change their profession or left the hospital shortly.

The current Finding of knowledge on VAP prevention is congruent with a cross-sectional study done in Dar-essalaam, Tanzania 2012, majority of the study subject of 118 subjects 54.2% of participants have an excellent knowledge scores[48]. In other study done in Cairo, Egyptin 2013where the study conducted at three critical care units with a convenience sample of 45 critical care nurses at Cairo university Hospitals where 90% had unsatisfactory knowledge Score [46].These differences might be due to the fact that majority of the study subjects in the Egyptian study were diploma holders and44.4% were internship nurses who had less than 2 years ofexperience innursing or may be due to the smaller sample size in the Egypt's study. In other study which was conducted in India, of the 138

critical care providers 71(51.4%) were diploma and 67(48.8%) degree holders, amongst all participants, 55.8% had adequate knowledge and 44.20% had inadequateknowledge [47], indicating the proportion of study subjects with inadequate knowledge is less in the context of the current study.the variation between the two studies possibly due to most of the study participant in the current study are degree holders where as majority in Indian study were diploma holders.

According to the findings in this study participants demonstrated adequate knowledge in the areas of recognizing educating ICU nurse on prevention of nosocomial infection can help decrease the risk of VAP, the need of ETT suctioning to ventilated patient as needed, performing hand washing for reducing the risk of VAP, Similarly, most nurses knew that Factors contributing to bacterial colonization of the aero-digestive tract were Contaminated hand of health workers ,Contaminated respiratory therapy equipment and Aspiration of contaminated secretion in to the lower airway. This finding indicates that nurses had knowledge of VAP prevention in areas of general infection control, which may be gained this general knowledge from their VAP prevention information from the formal education and/or ICU work experiences.

However, the study subjects lack knowledge in areas of VAP prevention including: type of suction systems recommended for intubated patients, frequency recommended to change humidifiers, range of head of the bed elevation, and effect of the prolonged use of stress ulcer prophylaxis to a ventilated patient. This might be due to limitation of the study participants on evidence-based practice of VAP and gaps in the curriculum that may not be incorporating in the Diploma and bachelor program.

In the current study educational level of the study participants showed significant association in their knowledge, nurses with Bachelor degree were found having adequate knowledge compared to nurses with Diploma holders, $X^2(1) = 4.17$ ($p = 0.0.041$), due to extensive nature of education given to bachelors.Age group was also found associated with knowledge level, age groups 28 to 32 demonstrated adequate knowledge compared to age groups between 23 and 27, $X^2(1) = 7.10$ ($p = 0.008$). Possibly due to Agegroup 28 to 32 hasa better work experience than age 23 to 27. Sex was also found with Knowledge, female nurses demonstrated adequate knowledge compared to male nurses, $X^2(1) = 4.17$ ($p=0.023$) this may be caused by the smaller sample of male nurses relative to the female

sample at the study areaand association between ICU working experience and knowledge was found highly statistically significant, X^2 (1) = 18.18 (p< 0.001).5-9 years' work experience are more knowledgeable than less than 4 years of work experiencethe reason might be that more experienced nurses have longer exposure to the day to day activity of care which might help them to identify the problem and find the solutions than less experienced nurses, so that, Seniority indicates better knowledge.

Finding of the current studyindicatesthat there is significant but a weak association between knowledge score on prevention of VAP and educational qualification whereX^2 (1) = 7.10 (p = 0.041)which implies that Nurses holding bachelor's degrees had significantly scores better than nurses holding diploma, This is similar with the study done in Sana'a city, Yemen, which is A descriptive cross-sectional survey carried out in 37 ICUs of 23 hospitals p value=0.007 .this similarity is possibly due to both study have high number of degree holders,Hence, knowledge is directly proportional to the level of education(49).

The current study also revealed that the study group with 5 to 9 year of work experience have better knowledge than less experienced one with a X^2 (1) = 18.181 p value <0.001which is a strong association. This is in line with a study done in Finland adult general ICU 2010 (n = 101) in a single academic centre the finding indicates that More experienced nurses performed significantly better than their less-experienced colleagues **(50).** The similarity might be due to build-up of knowledge through time increase knowledge and problem solving ability at the specific setting.

Unlike other studies this study found an association between knowledge with sex and Age, which implies females and age group between 28 to32 are more knowledgeable than male andage group 23 to 27, with a X^2 (1) = 5.156,p value 0.023 and X^2 (1) = 7.101,p value 0.008respectively.

Nurses' Practice toward the Prevention of VAP

This study revealed that 53.5% of the studied subjects showed adequate skill above the total mean score. This finding indicates that significant numbers of subjects (46.7%) were not provided good nursing practices towards the prevention of VAP.

Each item testing nurses' practice was examined on prevention of VAP, the Frequency of correct performance for each item in this study showed a better performance than the study conducted in Dares Salaam, Tanzania 2012. Almost all 100% of the participants of this study apply clean gloves during oral care, clean mouth using toothbrush or gauze moistened with mouth wash, Rinse mouth with a clean swab, Suction secretions as they accumulate, Clean and return equipment it to its proper place and wash their hands after oral care. Similarly, 96.7% of the observed participants as wash their hands after contact with a source of microorganisms, 76.7% used alcohol for hand rub 76.7% prepared sterile equipment required during suctioning, 80% Insert the catheter into the ETT gently by using aseptic technique and 90% of the subjects Position a patient in a semi recumbent during oral care. This indicated that nurses had performed good practices in these areas. This difference is possibly due to the general orientation given to nurses in the ICU settings.

Observation on some areas such as: hand washing practice before contacting the patient, giving oral care and after performing suctioning of ETT/tracheotomy, after patient contact, Application of water soluble jelly to patient's lips, and also nurses hand washing practice before entering ICU revealed that:, 20% wash their hands before contacting the patient, 3.3% wash their hands before giving oral care and after suctioning from the ETT/tracheotomy,13.3%wash their hands before suctioning, 23.3% After patient contact,6.7% Apply water soluble jelly to patient's lips, and also 100%observed nurses never practice to wash their hands before entering ICU, these finding is congruent with the same study done in Tanzania 2012 (48).This similarity might be due negligence or lack of awareness of nurses in the contribution for hand washing practice to the prevention of VAP.

Another area where nurses lacked performance was that discarding suction tube immediately after single use, and also the subject 100% missed practicing documentation of the procedures. This indicated that nurses had some limited practice; therefore, it is needed to provide update information to the nurses in these areas.

Finding of the current studyrevealed that there are no significant difference in practice between participants with education level as found X^2 (1) = 0.106(p = 0.744), age groups as found X^2 (1) = 0.375(p = 0.540) and between participants with different years of ICU working experience X^2 (1) = 0.097(p = 0.755).Which means the nurses socio-demographics characteristics, except gender X^2 (1) = 6. 563 (p = 0.010), are not significantly affect the practice of nurses this is implied that the performance level is influenced by other factors need more analysis. But females have better practical skill than males this might be the presence of highest numbers of female nurses at the study area.

Despite the availability of some studies in the developed countries, studies investigating level of nurses' practices regarding prevention of VAP are very limited, and finding of the practice cannot be broadly discussed in comparison to other similar studies. Therefore, it needs farther investigation and can be used as base line for future studies.

Finally, the study finding revealed that nurses wereperformed good practices However; a significant number (40.7%) of subjects lacked performances. This indicated that nurses havesomelimited practice; therefore, it is needed to provide update information to the nurses in these areas.

STRENGTH AND LIMITATION OF THE STUDY

Strength of the Study

- The data was collected using structured questionnaires and observational check list adapted and modified from other researches.
- Data collators were health professionals
- Reduction of Hawthorne effect i.e. participants' awareness of being in a study may cause them to change their practice so that to prevent this effect observer did exact observation after three days when the observed continued to perform their activities according to their normal day to day practice.

Limitation of the study

- The design of this study was descriptive cross-sectional study, with features of single data gathering, information provided to study participants may alter behavior during observation. Therefore, these drawbacks may limit to draw conclusion beyond the context of the study settings, but can be used as base line for future studies.
- Since the study design was cross-sectional method, the direction of causal relationship between Variables can't always be determined
- Use of convenient sampling technique may limit this study not to generalize towards source population
- The limitations of this study include the relatively small sample size and the limited hospitals, in which it was conducted, this being constrained by the time and resources available.
- The study is limited to ICU nurses working in the five selected hospitals.

CONCLUSION AND RECOMMANDATIONS

6.1. Conclusion

This study revealed that nurses had adequate level of knowledge (60.7%) and practice (53.3%) towards the prevention of VAP. This study also revealed that nurses lacked knowledge and practice in some areas. Lacking of practice areas were: 3.3% washing their Hands before oral care, 10% before patient contact, 13.3% before suctioning, and 25% after patient contact, 20% wear sterile gloves during suctioning from ETT, and of the study subject 100% missed practicing hand washing before entering ICU, not discarding suction tube immediately after single use and no documentation of the procedures. And the knowledge gaps were: 36.8% knew that head of bed elevation ranged from 30 to 45 degree, 37.6% knew that prolonged use of stress ulcer prophylaxis may increase colonization density of aero digestive tract, 28.2% and 31.6% knew that closed suction system and change in humidifiers every 2-7days/when ever needed were recommended respectively.

Chi-square test reveals that only gender have a statistical significant association with practice $x^2(1) = 5.563$; p-value = 0.010 and also factors such as Age, work experience, Sex and educational level have a statistical significant association with knowledge with a Chi-square test $X^2(1) = 7.101$ (p - 0.008), $X^2(1) = 18.181$ (p-0.000), X2(1)= 5.156 (p- 0.023) and X2(1) = 4.175 (p- 0.041) respectively. The association between the two dependant variables is not determined; since, it is not stated in the objectives of the study and needs farther investigation and can be used as base line for future studies.

These findings indicated that most nurses had performed good practices and have an adequate knowledge level. However, it was also shown that 39.3% and 46.7%of subjects lacked performances as well as knowledge respectively. This indicated that a significant number of nurses in the current study areas have inadequate knowledge and practice; therefore, it is needed to provide update information and training to the nurses in these areas.

6.2. Recommendations

- ❖ Based on the results of this study, it is indicated that most ICU Nurses had performed good practices and knowledgeableso encouragement, motivation, training and also planning an incentives for their hard work might be an important issues to keep their knowledge and practice consistence.
- ❖ In this study, it is also indicated that problem of lacked practice and knowledge at some areas regarding prevention of VAP among nurses is identified. To improve the quality of care and the quality of life of patients suffering from VAP, the following implications and recommendations are offered.
- ➢ The results of the study display information of nurses' knowledge and practice regarding prevention of VAP in the selected hospitals. This information should be transferred to the Director of nursing services, and hospital administrators.
- ➢ All necessary facilities required to maintain sepsis and documentation sheets should be made available at all time.
- ➢ Education and training program would help improving the quality of nursing care (52).
- ➢ Hospital administrator shouldprovide effective prevention of VAP policy as an institutional goal by developing standard guidelines for prevention of VAP for staffs in ICUs (53).
- ➢ The findings from this study will be the bases or reference for further studies in the field of VAP.
- ➢ This study can be improved by increasing the sample size and ICU containing hospitals to enhance the generalizability.
- ➢ A replication of this study using observation method is recommended to examine the level of nurses' practice regarding prevention of VAP.
- ➢ Predictive study of factors related to nurses 'practice for prevention of VAP is recommended for future study.
- ➢ Findings of this study reinforce the need for further research to support the development and implementation of policies that will help improve patient outcomes, decrease length of stay and healthcare costs, and help ICU Nursesto strive for rendering affordable and effective healthcare.

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ANNEX - Questionnaire

I. Information Sheet

Information sheet and consent form prepared for nurses who will participated in research project, a cross-sectional ASSESMENT OF KNOWLEDGE AND PRACTICE OF NURSES WORKING IN THE ICU TOWARD PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA AT SELECTED GOVERNMENTAL HOSPITAL, ADDIS ABABA, ETHIOPIA,2015.

Name of Principal investigator: Behailu Aferu

Name of the organization: Addis Ababa University, College of Health Sciences, Department of Nursing and Midwifery

Name of the Sponsor: Addis Ababa University

This information sheet and consent form is prepared to explain the study you are being asked to join. Please read / listen carefully and ask any questions about the study before you agree to join. You may ask questions at any time after joining the study. The investigator is final year MSN graduate student from the department of nursing, college of health science, Addis Ababa University, and one advisor from Addis Ababa University.

Purpose of Research Project

Knowledge and practice toward prevention of VAP could be highly influenced by different factors that can lead to Poor quality of nursing care, disorganization of the service, conflicting roles, medication error, poor diseases prognosis, readmission, dissatisfaction with the care provided, and increased mortality. These problems are manageable if a nurse can properly implement preventive measure and practice. This study will identify how the knowledge and practice performed by nurses influence on the prevention of VAP in the selected governmental Hospital. The results of the study will be used as base line information to design appropriate intervention strategies.

Procedure

To assess the knowledge and practice of ICU nurses on prevention of ventilator associated pneumonia at selected hospitals Addis Ababa Ethiopia you are invited to take part in this project. If you are willing to participate in this project, you will sign the consent form. Then after, you will receive the questionnaire to give your response.

You do not need to write your name on the questionnaire and all your responses and the results obtained will be kept confidentially by using coding system whereby no one will have access to your response.

Risk/ Discomfort

By participating in this research project, you may feel that it has some discomfort especially on will take your time about 30 minutes. We hope you will participate in the study for the sake of the benefit of the research result. There is no risk in participating in this research project.

Benefits

If you participate in this research project, there may not be direct benefit to you but your participation is likely to help us in assessing knowledge and practice of ICU nurses on prevention of ventilator associated pneumonia among nurses for their inpatient. Ultimately, this will help us to identify the gap and take the appropriate intervention by the authorized stakeholder.

Incentives

You will not be provided any incentives or payment to take part in this project.

Confidentiality:

The information collected from this research project will be kept confidential and information about you that will be collected by this study will be stored in a file, without your name, but a code number assigned to it. In addition, it will not be revealed to anyone except the principal investigator and will be kept locked with key.

Right to refuse or withdraw:

You have full right to refuse from participating in this research. You can choose not to respond to some or all questions if you do not want to give your response. You have also the full right to withdraw from this study at any time you wish, without losing any of your right.

Persons to contact:

If you have any question to ask, please contact

Behailu Aferu

Tel: +251-923 29 37 12

Email = *fatbeh.a@gmail.com*

II. Consent form

I have read all the process and the objective of the study and I have understood the same as written that includes informed about the purpose, advantage, and disadvantage of this study titled assessment of ICU nurse toward the prevention of VAP in selected governmental hospitals**.** I also understood that the research imposes no risk and no composition would be provided to me and my family. I have been told that if I fill discomfort to respond to any of the question, I fill free to drop it any time I wish to do so. I have understood the information given and the participation is completely voluntary based. I have been told that my answers to the questions will not be given to anyone and not expect to write my name. Now I am giving my consent to participate in the study voluntarily.

Could I have your permission to continue?

1. Yes
2. No, Stop

Witness: Signature_____ Date _____

Data collector:

Name_____ Signature_____ Date_____

Result: 1. Questionnaire completed _____

2. Questionnaire partially completed _____
3. Participant refused _____
4. Others (please Specify) _____

Checked by Supervisor:

Name _____Supervisor's Signature _____Date _____

III. Questionnaire

Part I : Socio demographic characteristics of the respondent	
Question	**Response**
Sex	1. Male 2. Female
Age	_____years
Education status	1. Diploma 2. Degree 3. Master 4. Others specify_____
Year of experience	1. 6 month to ≤ 4 years 2. 5 to ≤9 years

Part II- ICU nurses knowledge about Prevention of Ventilator Associated Pneumonia.

Choose the best Answer

1. RecommendedEndotracheal routeof intubation

a. Oral intubation

b. Nasal intubation

c. Both routes

d. No recommendation

2.Recommended type of positioning for ventilated Patient (If there is no contraindication)

a. Supine positioning is recommended

b. Semi recumbent positioning is recommended

c. The position of the patient does not influence the risk for VAP

d. I do not know.

3.Advantage of Endotracheal tubes with extra lumen for drainage of sub-glottic secretions

a.reducing the risk for VAP

b. increasing the risk for VAP

c. Do not influence the risk for VAP

d. Increase the amount of secretions

4. factors contributing to bacterial colonization of the aero-digestive tract include-

a. Contaminated hand of health workers.

b. Contaminated respiratory therapy equipment.

c. Aspiration of contaminated secretion in to the lower airway.

d. all

5.A nurse is required to discard a suction catheter

a. immediately after a single use

b. can be cleaned and reused

c. can be used without being cleaned

d. Every 24 hours

6. Recommended Frequency of changing suction systems

a. Daily changes (or when clinically indicated)

b. Weekly changes (or when clinically indicated)

c. For every new patient (or when clinically indicated)

d. No need of changing

7.How often is recommended to change humidifiers

a. Every 2-7 days (or whenever necessary).

b. Every day (or whenever necessary).

c. Every month (or whenever necessary).

d. I do not know.

8.Suction catheter Insertion into the Endo-tracheal tube

a. Is a sterile procedure

b. Is a clean procedure

c. Can be a clean or a sterile procedure

d. I do not know.

9.Dusting of respiratory and bedside equipment with antiseptic should be done

a. Every shift and whenever soiled.

b. At time of patient discharge only.

c. Weekly.

d. Every other days

10. Recommended type of suction systems for intubated patients

a. Open suction systems

b. Closed suctions systems

c. Both systems

d. I do not know

11.Head of the bed elevation should be range from

a. 0-15 degree

b. 15-30 degrees.

c. 30-45 degrees.

d. Not recommended

12.A nurse caring a ventilated patient is required to wear sterile gloves during

a. Oral suctioning

b. ETT suctioning

c. Oral and ETT suctioning

d. I do not know.

13.A nurse caring a ventilated patient is required to wash hands

a. Before oral and ETT suctioning

b. After oral and ETT suctioning

c. Before and after oral / ETT suctioning

d. I don't know.

14.Ventilator Associated Pneumonia (VAP) comes from except

a. Community pneumonia

b. Contaminated ventilators

c. Other patients

d. Colonization the subsequent aspiration

15. Perform Oral care by using a swab moistened with mouth wash and water is recommended

a. once in a shift

b. every 4 to 6 hours

c. whenever necessary

d. Every other day

16.Prolonged use of Stress ulcer prophylaxis to a ventilated patient

a. Not to be used for patients who are at high risk of developing a stress ulcer.

b. May increase the colonization density of the aero digestive tract.

c. Routine stress ulcer prophylaxis does not influence the risk of VAP.

d. Decrease risk for VAP

17.Maintenance of a high nurse to patient ratio in the ICU is associated with

a. increased risk for VAP

b. decreased risk for VAP

c. does not influence the risk for VAP

d. I don't know

18.Educating ICU nurses on prevention of nosocomial infection helps to-

a. Increased rates of VAP

b. Decreased rates of VAP

c. Does not influence the rates VAP

d. Not needed

19. Recommended Frequency of ventilator circuit change is

a. every 48 hours (or when clinically indicated)

b. every week (or when clinically indicated)

c. every new patient (or when clinically indicated)

d. I do not know

20.Chest physiotherapy is recommended for ICU patients'

a. to reduce the risk for VAP

b. to increase the risk for VAP

c. to reduce increased temperature in ICU patients

d. I do not know

21.If you compare the Adjustable beds with the non-adjustable ones

a. Adjustable beds increase the risk of VAP

b. Adjustable beds reduce the risk of VAP

c. Both beds have no influence upon the risk of VAP

d. I don't know

22.Frequency of ETT suctioning should be done to patient

a. Routinely to every shift.

b. As needed.

c. Frequently

d. I do not know.

23.Early weaning of mechanical ventilator mode

a. reduces the risk for VAP

b. increases the risk for VAP

c. do not influence the risk for VAP

d. I don't know

24. Over feeding of ventilated patient may increase risk of aspiration leading to-

a. increased the risk for VAP

b. decreased the risk for VAP

c. do not influence the risk for VAP

d.No answer

25.ETT tube with well maintained pressure cuff for ventilator patient helps to

a. decrease the risk for VAP

b. increase the risk for VAP

c. Do not influence the risk for VAP

d. Not recommended

26.Unplanned extubation can increased risk of aspiration leading to

a. Increased the risk for VAP

b.Decreased the risk for VAP

c. Do not influence the risk for VAP

d. don't know

27. Principles of VAP Prevention includes-

a. Staff education

b. Colonization reduction

c. Aspiration avoidance

d. All

Thank you for your participation!!!

PART III Checklist

Part III- Observational check list for nurses ICU practice on Prevention of Ventilator Associated Pneumonia		
SEX: Female/ Male Age --------- **Education level: MSC**----- BSC----- Diploma---- Other……. **Work experience: A.** 6 month-≤4 yr ……**B.** 5 - ≤9 yr…….		
VAP PREVENTION PRACTICE	**YES**	**NO**
Hand washing practice		
Before entering the ICU		
Before contacting the patients		
After contacting the patients		
After contact with a source of microorganisms		
Use of alcohol hand rub		
Suctioning from the ETT/tracheotomy		
Hand washing before the procedure		
Prepare and use of sterile gloves for ETT suctioning		
Prepare sterile equipments required during suctioning		
Maintaining environmental cleanness		
Using aseptic technique in inserting the catheter into the ETT		
Discard suction tube immediately after one single use		
Hand washing after the procedure		
Documentation of the procedure		
Oral care practice		
Hand washing before giving oral care		
Use of clean gloves for oral care		
Position a patient in a semi recumbent		
Clean mouth using toothbrush or gauze moistened with mouth wash and water		
Rinse mouth with a clean swab		
Suction secretions as they accumulate (if necessary)		
Apply water soluble jelly to patients lips		
Clean used equipment and return it to its proper place		

Hand washing after oral care		
Documentation of the procedure		
TOTAL SCORE / 100%		

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ADDIS ABABA UNIVERSITY
SCHOOL OF ALLIED HEALTH SCIENCES
COLLEGE OF HEALTH SCIENCES
DEPARTMENT OF NURSING &MIDWIFERY

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Reference A/A/M/B/6266

Date 15/4/2015

To Yekatit 12 Hospital Medical college
Zewditu memorial Hospital
Minilik Hospital

Addis Ababa

Subject: Request to access Health Facilities to conduct approved research

This letter is to support **BEHAILU AFERU** to conduct research, which is entitled as "ASSESMENT OF KNOWLEDGE AND PRACTICE OF NURSES WORKING IN ICU TOWARD THE PREVENTION OF VENTILETOR ASSOCIATED PNEMONIA ". The study proposal was duly reviewed and approved by Addis Ababa Health Bureau IRB, and the principal investigator is informed with a copy of this letter to report any changes in the study procedures and submit an activity progress report to the Ethical Committee as required.

Therefore we request the mentioned HOSPITALS and staffs to provide support to the Principal investigator.

With Regards

Eyobed Kaleb
Ethical Clearance committee

Cc **BEHAILU AFERU**
Addis Ababa
To Ethical Clearance Committee
Addis Ababa

Date: 2015/2015

Ref. No. pmas/1117

Institutional Review Board (IRB) of St. Paul's Hospital Millennium Medical College (SPHHMC)

Ethical Clearance

Research Title: - Assessment of knowledge and practice of nurses working in the ICU toward the prevention of ventilator associated pneumonia

Principal Investigator: Behylu Aferu

The IRB of SPHMMC has reviewed the above mentioned research proposal and made the following decision:-

1. Approved:- ✓
2. Approved with recommendation:- _____
3. Approved on condition:-
4. Disapproved:- _____

The decision is valid for 12 months and the research should be conducted in compliance with the protocol/proposal approved by the IRB of SPHMMC. Any subsequent revision/amendment of the protocol/proposal needs approval before conduct of the research. The researcher should also submit written summaries of the research status to the IRB every 3 months. Upon the conclusion of the study, manuscripts and thesis work to the final/completed research project needs to be submitted to the IRB.

IRB Chair: Dr Birke Anbesse

Signature: _____

Date: May 18/ 2015

Cc:

- Vice Provost for Academic and Research
- IRB
- Behylu Aferu
  SPHMMC