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DEPARTMENT OF NURSING AND MIDWIFERY

ASSESSMENT OF KNOWLEDGE, PRACTICE AND ASSOCIATED FACTORS OF ADULT INTENSIVE CARE NURSES' ON PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA IN SELECTED HOSPITALS IN ADDIS ABABA, ETHIOPIA

BY:

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APPROVED BY THE BOARD OF EXAMINERS

This thesis by **Girma Alemu** is accepted in its present form by the Board of Examiners as satisfying thesis requirements for degree of masters in Advanced Adult Health Nursing.

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DEDICATION

My dedication is belongs to all ICU nurses and other ICU health care workers

ABSTRACT

BACKGROUND- Ventilator-associated pneumonia (VAP) is the most common nosocomial infection, with the prevalence rates ranging from 10% to 70% in critical/ Intensive care units. It is a sub-type of hospital-acquired pneumonia which occurs in people who are on intubation or mechanical ventilation that was not present at the time of admission to hospital or that occurs 48 hours after intubation and mechanical ventilation through an endotracheal or tracheotomy with reported incidence of 6–20 times higher in these patients.

OBJECTIVE: To assess knowledge, practice and associated factors of Adult Intensive Care nurses' on prevention of Ventilator Associated Pneumonia (VAP) in selected Hospitals in Addis Ababa, Ethiopia.

METHODS AND MATERIALS- A facility based cross-sectional and observational study was conducted on 129 Adult Intensive Care nurses to assess their knowledge, practice and other associated factors by using self-administered questionnaire and observational checklist. Information letters, consent forms and questionnaires were handed to nurses working in the Adult ICU; by data collectors. Data was coded and entered into EPI INFO 3.5.4 and Analyzed using SPSS version 16.0 for descriptive and inferential statistics.

RESULTS: Out 129 respondents, 78 (60.5%) were females, 73 (56.6%) had diploma, Majority of Adult Intensive Care nurses 79 (61.2%) had no ICU training, and 87 (67.5 %) had been working in the ICU for less than 6 years, 66 (51.2%) scored below mean score, had inadequate knowledge. There was a significant difference in knowledge between respondents with ICU training as found ($p_{value} = 0.04$) and between participants with different educational level (p_{value} =

0.021). Significant difference in practice was found between ICU nurses who had ICU training ($p_{value} = 0.038$) and between nurses with different years of Experiences ($p_{value} = 0.041$)

CONCLUSION: The study reveals that majority of nurses working in the Adult Intensive Care Units had inadequate knowledge and practice. Nevertheless, those nurses who trained and had high educational level have adequate knowledge than those nurses who had more years of experience, where as those experienced and trained nurses were practicing more adequately than those nurses who hold first and second degree.

RECOMMENDATIONS: I would like to recommend those program efforts working towards prevention of VAP, and improving Knowledge and practices of Intensive care nurses‘.

Key words: knowledge, practice, nurse(s), Adult intensive care unit, Ventilator associated pneumonia

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LIST OF ACRONYMS AND ABBREVIATIONS

AAUCHS - ADDIS-ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCE

AAUMF - ADDIS-ABABA UNIVERSITY FACULTY OF MEDICINE

AICU - ADULT INTENSIVE CARE UNIT

CDC - COMMUNICABLE DESEASE CONTROL

ETS - ENDOTRACHEAL TUBE SUCTIONING

ETT - ENDOTRACHEAL TUBE

Gov't - GOVERNMENT

HAI - HEALTH ACQUIRED INFECTION

HCW - HEALTH CARE WORKERS

HOB - HEAD OF THE BED

ICU - INTENSIVE CARE UNIT

IHIC - INTERNATIONAL HEALTH INITIATIVE CAMPAIGN

IDSAR - INFECTIOUS DISEASE SOCIETY OF AMERICAN REPORT

NGO's - NON- GOVERNMENTAL ORGANIZATIONS

MUHAS - ADDIS ABABA UNIVERSITY COLLAGE OF HEALTH SCIENCE

SPSS - STATISTICAL PACKAGE FOR SOCIAL SCIENCES

VAP - VENTILATOR ASSOCIATED PNEUMONIA

WHO - WORLD HEALTH ORGANIZATION

1. INTRODUCTION

1.1. Background of the Study

Ventilator-associated pneumonia (VAP) is a sub-type of hospital-acquired pneumonia which occurs in people who are on intubation or mechanical ventilation that was not present at the time of admission to hospital or that occurs 48 hours after intubation and mechanical ventilation through an endotracheal or tracheotomy with reported incidence of 6–20 times higher in these patients (1-2). It is the most common nosocomial infection, with the prevalence rates ranging from 10% to 70% in critical care units.

The VAP is caused due to aspiration, which is the primary route of transmission of pathogens into the lungs. Factors causing aspiration are oropharyngeal colonization, gastric fluid, and enteral feeding. At times majority of the patients admitted in ICU are already colonized with bacterial infections. In addition cross contamination in ICU is also one of the major causes of VAP in most of the ICU‘s (1).The 2003 guide lines form the centers for disease control and prevention (CDC) reported that 63% of patients admitted to an ICU have oral colonization with a pathogen associated with VAP(3).

VAP is characterized by a new or a progressive pulmonary infiltrate, fever, leukocytosis and purulent tracheo-bronchial secretions (4-5). It carries a high mortality rate ranging 6% - 68% and may be as high as 74% in high risk populations, indicating a serious health hazard among ventilated patients (6).

Intubation and mechanical ventilation both increase the risk of bacterial pulmonary infection because the invasive endotracheal tube allows direct entry of bacteria into the lower respiratory tract since the tube is located in the trachea. Bacterial colonization in the respiratory

tract is further facilitated by the absence of the cough reflex and excessive mucus secretion in the mechanically ventilated patients (7).

Prolonged ventilation increases the risk of VAP, increases hospital stay which dramatically increases mortality rates. The frequency of VAP in the ICUs is high and VAP‘s negative impact on patient outcomes and resource utilization is huge (8).

The hospital-wide prevalence of VAP was 1.7% and 2.9% in studies conducted in Algeria and in Senegal, respectively (9-10). One Senegalese study conducted in an ICU find that, the proportion of ventilated patients affected by VAP was 50% (11).

Advanced diagnosis and early management of possible complications may contribute to low incidence; while lower number of cases and lack of adequate nursing staff (which should ideally be 1:1) may adversely affect the quality of care given to the patients may be the reasons of increased incidence, (12) even though VAP is a serious problem in developed countries the lowest incidences in developing countries may be contributed by inadequate knowledge and awareness about the problem which can cause the disease not to be well addressed. Strategies have been created in an attempt to find a solution to the problem of VAP in the world; these strategies incorporate a number of evidence based strategies proved in the literature to decrease VAP and increase positive patient‘s outcomes (12).

The nurses‘ working in the ICU or ICU nurses are in the best position to put the above strategies into practice as they are at the patient‘s bedside 24 hours a day and therefore they play an important role in the prevention of VAP (5). Nevertheless nurses need to have an awareness of the problem as well as knowledge on the above prevention strategies so as to adhere to such practices. Skilled and knowledgeable nurses are extremely important and needed to make

appropriate decisions in patient care and minimize risks to patients. ICU Nurses knowledge should bring confidence to make appropriate decisions and prevent poor outcomes in the recovery of mechanically ventilated patients (13).

1.2. Problem Statement

VAP is the most common nosocomial infection in ICUs and represents 25% of all ICU infections (14-15). VAP cost is reported to be as high as $10 billion per year (16).

Patients in intensive care units (ICUs) are identified as targets for quality-of-care and patient-safety improvement strategies. Approximately 1.7 errors per patient occur in the ICU daily, and nearly half of these errors were attributable to ICU nursing staff (17). Ventilator-associated pneumonia (VAP) is known to be one of the most important infections acquired in Intensive Care Units (ICUs), (18) with an incidence of 6-68%, and a 10-70% morbidity-mortality rate and an increase in healthcare costs (8). VAP is a problem in ICU and dramatically increases morbidity and mortality rates on mechanically ventilated patients. It is among the most common infectious complication among patients admitted to ICU (19). Clinical signs of pneumonia (fever, pulmonary infiltrates, and purulent pulmonary secretion) present in ICU patients are caused by VAP in only 30% to 40% (20-21).

The cost of adverse events in the ICU is substantial, not only because almost 150,000 life threatening errors occur annually in teaching hospital ICUs (22). But also because the economic cost of 1 adverse event is approximately $4000 (23). When VAP occurs, it prolongs the ICU length of stay, ultimately increasing hospital stay and the risk of death in critically ill patients. VAP is also associated with an increased duration of mechanical ventilation and increased health care costs due to an increased ICU and hospital length of stay (24).

VAP prolongs the length of stay by up to 50 days, and increase the duration of mechanical ventilation by 5 to 7 days which generates substantial extra cost of care (5).

VAP is one of the most common infections acquired by Patients in ICU, Society for Healthcare Epidemiology of America (IDSAR); 10%-20% of patients undergoing ventilation in America developed VAP. This broad range may reflects the disparity in diagnostic criteria and differences between populations in disease severity Quantitative culture sampling of endotracheal aspirates may optimizes the diagnosis and management of hospital-acquired pneumonia including VAP (25).

Ventilator associated pneumonia is among three upper most infection occurring in health facilities commonly known as hospital acquired infection (HAI), prevalence varied between 2.5% and 14.8% in Algeria (26). Burkina Faso, Senegal and the United Republic of Tanzania (27). A study from Burkina Faso on HAI prevalence among surgical patients reported surgical site infection as being the most common type, followed by urinary tract infection and VAP (26-27). In another study from Algeria, the cumulative incidence of ventilator associated pneumonia in the ICU was 2.4% (28). No microbiology data were reported in these studies. One study conducted in an ICU find that, the proportion of ventilated patients affected by VAP was more than half percentage (29).

Nosocomial infections are the most common complications affecting hospitalized patients and have significant morbidity and mortality (30). VA P is the most frequent and costly infectious complication in ICU patients, which has been estimated to cost at least $40,000 per patient as estimated in 3 matched cohort studies. The factors that are important in this process are awareness of the problem, understanding the pathogenesis, and knowledge of evidence-based guidelines. The prevention and control of VAP in ICU is said to depend on the education and sensitization of ICU staff members towards the problem and on the application of measures to prevent its occurrence (24).

Similarly since ventilator support is directly related to critical care and its outcomes, improvements in ventilator support is required to be understood in order to improve Emergency and Critical Care (31).

Although VAP is a serious problem found in ICU in developed countries, the exact magnitude as well as intensity in developing countries is not clear, It is therefore reasonable querying the situation while the rate of VAP in countries with well equipped ICU, good number of ICU nurses and have advanced ventilator setup have an incidence rate of between 6% - 68% (8).

The VAP incidence ranged from 10 to 41.7 per 1000 ventilator-days in different developing countries. This variation is probably related to several factors, including differences in patient populations (medical, surgical, vs. combined ICUs), differences in infection control and critical care practices, and variability in data collection methods as well as variability in the definition of VAP. The VAP incidence was lower in surgical ICUs compared to medical-surgical ICUs with regard to nurses and institutional factors (32-34).

Thus, this study finds an out Intensive care nurses associated factors contributes to the development Ventilator Associated factors (VAP) and the relation between year(s) of working experience, educational level, ICU training, and knowledge and practice of intensive care nurses in Preventing VAP and further, the study accentuate the research gap in developing countries, Ethiopia, about identifying the current Knowledge and practice of critical care nurses‘ with regard to prevention of VAP and maintaining patient‘s Health.

The research Gap (Questions)

1. Do Adult intensive care nurses have adequate knowledge on prevention of VAP?
2. Are Adult intensive care nurses practicing preventive measures of VAP?
3. What are the other associated factors contributes for the development of VAP with regard to nurses and nursing care?
4. Is there any association between level(s) of Education, ICU training, year(s) of Experience, and Knowledge of Adult intensive care nurses on prevention of VAP?

1.3. Significance of the Study

This study identifies the knowledge, practice and other associated factors of nurses working in the intensive care unit on prevention of Ventilator Associated pneumonia that entail a significant contribution for nursing practice, education and further research which will contribute to the quality of care and improvement of critical patient‘s outcome. Because of its importance and impact on morbidity in ICU patients, VAP prevention was included in the IHI campaign to save 100,000 lives (35). Salahuddin and colleagues (36) found a 51% reduction in VAP incidence through an education for VAP prevention (37). Therefore, this study will draw-round an outstanding knowledge-practice gap of Nurses working in the ICU. Though, the exact magnitude as well as intensity in developing countries is not clear, VAP is a serious problem found in ICU in developed countries (8).

The finding of this study is a grand and novellas input to be used by any facilities that have been delineated with knowledge and practice of ICU nurses or nurses working in the ICU created in the spur of their understanding and it helps other Governmental and NGO‘s who want to work on the strengthening of nurses knowledge and practice.

Overall, the findings have important implications for policy and decision making in health care planning, in allocating resources (human, financial…etc) also helps for trend analysis for those program efforts working towards prevention of VAP and improving nurses‘ knowledge and practice (nursing care) with an entail to reduce or preventing VAP in the institution providing the service.

2. LITERATURE REVIEW

A literature was reviewed based on classes of concepts that blended with and ease to guide this study. The review of the literature is begin with the entail description of the primary concepts in the intended categories of General characteristics of the population, knowledge for the prevention of VAP, practice on the prevention of VAP, Associated factors and the strategies for the prevention of VAP . An overview of the conceptual framework and literature review is described as follows.

2.1. General Characteristics of the Population

The prevention and control of VAP in ICU are dependent on the education and sensitization of ICU staff members towards the problem and on the availability of equipment necessary for controlling cross infection between environment, health provider and patients.

The questionnaire was distributed to 855 nurses during the annual congress of the Flemish Society for Critical Care Nurses. Of the 855 participants, 638 completed the questionnaire. Most respondents were females (n = 472; 74.0%); about one quarter 9 (n = 153; 24.0%) had < 1 year of ICU experience, 111 (17.4%) 1 -5 years, 100 (15.7%) 6 – 10 years, and 274 (43.0%) > 10 years. A degree in emergency and critical care was held by 68% (n = 437) of respondents (25, 38).

The average score was 3.7 on nine questions. No substantial differences were found between males and females. Nurses with < 1 year experience performed worse than nurses with > 1 year experience. Nurses holding the degree had significantly better scores than those not holding it. Linear regression analysis identified years of experience and degree to be independently associated with better knowledge (38).

Nurses working in the ICUs of the three hospitals included in the study done in South Africa only 23% have adequate knowledge on the evidence based guidelines for prevention of VAP (38).

According to Study conducted in Tanzania in 2012, One hundred and eighteen ICU nurses were recruited and all completed the study, about 64(54.2%) had either diploma or Advanced diploma in nursing, majority of ICU nurses 105 (88.9%) had no intensive care training, and 80 (67.8 %) were working in ICU for less than 10 years (39).

2.2. Knowledge

ICU nurses have been found to be in the best position to put knowledge into practice as they are at the patient‘s bedside 24 hours daily providing nursing care and therefore play an important role in the prevention of VAP (40). Nevertheless nurses need to have an awareness of the problem as well as knowledge so as to adhere to such practices. Various measures to prevent VAP have been reported in the literature, however there are very few data concerning nurses‘ knowledge on VAP prevention and the level of their practice, as well as factors that may influence their application at the bedside, lack of knowledge may be a barrier to practice (9, 41).

If nurses do not have enough knowledge on measures proven to decrease VAP rates they may not have the necessary confidence to take action and make decisions regarding such practices. Patient recovery may be delayed and increased risks of complications from mechanical ventilation such as VAP, which are risks that can be prevented (42).

A study conducted among European intensive care nurses, on knowledge levels and evidence based guidelines for prevention of VAP, low scores were found amongst European ICU nurses‘

knowledge for prevention of VAP, and the average score in the European study was 4.06 on nine questions (45.1%). ICU nurses lack knowledge on prevention of VAP and awareness about VAP prevention strategies was low, this implies, the need for education based on current evidence (29).

In Tanzania, at Muhimbili National Hospital, the incidence of ventilator support ranges from 20 - 40 patients per a week (short term ventilation) to patients who undergo major surgery; with about 15 patients ventilated for a period of more than three days (long term ventilation) in a month indicating a high use of ventilator support. About 40 patients were admitted in general ICU from 1st April-1st May 2012, 20 patients among them were mechanically ventilated and 1 case of VAP diagnosed (43).

The study conducted on knowledge and practice of intensive care nurses on prevention of ventilator associated pneumonia at Muhimbili national hospital, Dar es salaam, in 2012 in Tanzania on 118 ICU Nurses was suggesting the knowledge scored and their levels were as follows: Of the 118 ICU nurses 54.2% scored 100% - 70% leveled excellent, 16.1% scored between 69% - 60% leveled very good, 19.5% scored between 59% - 50% leveled good, 8.5% scored 49% - 40% leveled average and 1.7 scored between 39% - 0% leveled poor (44).

Study done in South Africa show that, Of the 83 participants, (21.69%; CI 95% 13.4% ; 32.1%) achieved a pass mark of 70% on the multiple choice part of the questionnaire and were considered to have adequate knowledge on the evidence based guidelines for prevention of VAP. The mean score of participants was 4.25 (SD 1.537 CI 95% 3.92; 4.59) on nine questions (45).

Lack of knowledge is commonly recognized as a crucial hurdle to adhering to the guide-lines. Surveys evaluating the knowledge of ICU nurses about evidence-based guidelines for the prevention of VAP found overall poor test scores, suggesting that low knowledge levels could contribute to limited adherence to infection-prevention guidelines (46-48).

An exploratory descriptive study conducted on July 2011 in two ICUs of a large university hospital in Mato Grosso do Sul, Brazil, To evaluate the knowledge of nursing professionals in the Intensive Care Unit (ICU) about endotracheal aspiration (ETA) for open system, in which a quantitative approach was used in a sample consisted of 27 professionals of whom 51.9% were male. Results: Globally, the knowledge of professionals was qualified as fair (73.2% correct), but worryingly, it was considered poor in five areas with differing results among the professional categories; taking into account that incorrect knowledge generates inappropriate behavior, it is inferred that the practice of these subjects may compromise patient safety and conclude that the nurses working in the ICU had a knowledge deficits in some aspects of ETA, a fact that deserves investment regarding teaching and nursing (49).

In addition to basic insights and knowledge, skills, attitudes, and social and organizational context will determine the level of success in reducing infection rates. Because it is multi-factorial the result of many factors, overall adherence to evidence-based interventions is highly variable and often at a disappointing level (50). It is clear that a new paradigm of nosocomial infection prevention should be based on a multidisciplinary and evidence-based effort with an agenda focused on patient safety promotion and quality improvement. A cornerstone of this approach is the Institute for Health Improvement (IHI) initiative, which incorporates a limited number of effective interventions into a bundle that is both conceptually simple and feasible (51).

2.3. Practice

The study conducted in Tanzania, among 118 ICU nurses: Large proportion (100%) of nurses observed not wash their hands before entering ICU, 83.3% wash their hands before and 66.7% after patient contact. Large proportion of nurses (66.7%) observed to wash their hands after contact with a source of microorganism it was also found that the use of alcohol rub was very minimal (30%). Large proportion (83.3%) of nurses wears sterile gloves though small proportion practice hand washing (33.3%) before and (30%) after suctioning. About (90%) of nurses wear clean gloves, (80%) clean patients mouth using toothbrush or gauze moistened with mouth wash and (73.3%) clean equipment and returns it to its proper place while small proportion (27%) of nurses applies water soluble jelly to patients‘ lips at a time of Oral care practice (44).

Most nurses practice nursing according to what they learned in nursing school as well as their experiences in practice. If one takes into consideration the number of changes that occur in nursing practice on a regular basis, it is essential to keep updated and have knowledge of the best current practice (9).

The Centers for Disease Control (CDC) established recommended guidelines to decrease the risk of VAP. It is these best practice interventions that nurses should follow when caring for mechanically ventilated patients. The 2003 CDC guidelines reported that 63% of admitted patients in the ICU have oral colonization associated with a pathogen resulting from VAP (52). The CDC provided a set of seven guidelines to reduce risks related to hand washing, wearing gloves, suctioning, elevated head of bed (HOB), education, oral hygiene program, and use of antiseptic rinse. Studies suggested that best practices for reducing VAP were not consistently implemented (52).

2.4. Associated Factors

Factors related to Knowledge: In the study conducted in Tanzania, among 118 ICU nurses, Adjusting for education, ICU training and years of experience in a multivariate logistic regression model reveal the following results; Correlation between level of education, ICU training, years of ICU working experience and knowledge of ICU. No significant difference in knowledge between participants with different education level as found ($p = 0.55$), ICU training as found ($p = 0.64$) and between participants with different years of ICU working experience ($p = 0.34$) and with regard to practice the Correlation between level of education, ICU training, years of working experience and practice of ICU nurses on prevention of VAP, there is no significant difference in practice between ICU nurses with different ICU training as found ($p = 0.53$) and years of working experience as found ($p = 0.62$). Significant difference in practice was found between ICU nurses with different education level ($p = 0.03$) (44).

Although any patient with an endotracheal tube in place for more than 48 hours is at risk for VAP, certain patients are at higher risk. The risk factors for VAP can be divided into 3 categories: host related, device related, and personnel related. Host-related risk factors include preexisting conditions such a immune-suppression, chronic obstructive lung disease, and acute respiratory distress syndrome. Other host-related factors include patients‘ body positioning, level of consciousness, number of intubations, and medications, including sedative agents and antibiotics. Bacterial contamination of endotracheal secretions was higher in patients in the supine position than in patients in the semi-recumbent position (53).

Whether due to a pathophysiological process, medication, or injury, decreased level of consciousness resulting in the loss of the cough and gag reflexes contributes to the risk of

aspiration and therefore increased risk for VAP (54). Re-intubation and subsequent aspiration can increase the likelihood of VAP 6-fold (55).

Device-related risk factors include the endotracheal tube, the ventilator circuit, and the presence of a nasogastric or an orogastric tube. Secretions pool above the cuff of an endotracheal tube, and low cuff pressures can lead to micro aspiration and/or leakage of bacteria around the cuff into the trachea. Nasogastric and orogastric tubes disrupt the gastro esophageal sphincter, leading to reflux and an increased risk for VAP. The question of whether placement of nasogastric or orogastric tubes distal to the pylorus decreases the risk of aspiration and VAP remains unanswered (56). The results of studies on the relationship between use of small-bore feeding tubes and the incidence of VAP have been inconclusive (57). The Centers for Disease Control and Prevention makes no recommendations about routine use of post pyloric feeding tubes or small-bore feeding tubes, because these issues remain controversial and further research is needed (58).

Improper hand washing resulting in the cross-contamination of patients is the biggest personnel-related risk factor for VAP. Patients who are intubated and receiving mechanical ventilation often need interventions such as suctioning or manipulation of the ventilator circuit. These interventions increase the likelihood of cross-contamination between patients if healthcare staffs do not use proper hand-washing techniques. Failure to wash hands and change gloves between contaminated patients has been associated with an increased incidence of VAP (59-60).

2.5. Strategies and Equipments Necessary to Prevent VAP

Data from an Italian study carried out at Cisanello Hospital indicated that nurses tend to apply measures automatically by simply following protocols and instructions given by physicians or colleagues without being fully aware of what and why they actually do (13).

This differ from the current study where large number 89.83% of ICU nurses have knowledge and are aware of what they are supposed to do but their practice on VAP preventive strategies were found not widely applied by nurses in a recommended manner, this can be due to shortage of ICU nurses and lack of enough equipment therefore application of recommended practice during nursing intervention requires not only adequate knowledge but other associated factors have to be well addressed (44).

In Tanzania Muhimbili National Hospital; continuous education and sensitization of ICU staff members toward infection control including VAP control is done through different education program, journal clubs, seminars, case presentation and other means which target on quality care improvement. However limited availability of equipment necessary for controlling cross infection between environment, health provider and patients, delay in restoring destroyed equipments like water tap hinders the adherence to adequate practice (39, 44).

Strategies have been created in an attempt to find a solution to the problem of VAP. These strategies incorporate a number of evidence based strategies proved in the literature to decrease VAP and increase positive patients‘ outcomes. There are 21 strategies for prevention of VAP and these are divided into 10 physical strategies, three positional strategies and eight pharmacological strategies. The three major strategies are:-

The physical strategies include: Route of endotracheal intubation, Systematic search for maxillary sinusitis, frequency of ventilator circuit changes, type of humidifier, airway humidification: frequency of humidifier changes, endotracheal suctioning system: closed vs. open endotracheal suctioning system: frequency of change, subglottic secretion drainage, Timing of tracheostomy and Use of bacterial filters.

The positional strategies includes; kinetic bed therapy, Semi recumbent positioning and prone positioning.

The pharmacological strategies are: Prophylactic aerosolized antibiotics, Prophylactic nasal antibiotics, Prophylactic intravenous antibiotics, Prophylactic topical/ topical plus intravenous antibiotics, Oral decontamination with chlorhexidine, Oral decontamination with povidone - iodine, Oral decontamination with iseganan and Prevention of maxillary sinusitis. The guidelines which incorporate all the above strategies were created by a multidisciplinary panel composed of intensivists, infectious disease specialists, intensive care nurses, infection control nurses, ICU pharmacists and respiratory therapists as well as representatives from the Canadian Patient Safety Institute (42, 61).

In summary, the current study found that ICU nurses knowledge on prevention of VAP is statistically not associated with ICU training, level of education and years of experience (p value > 0.05). This is similar with the findings of the global European study, (57) and similarly to the study done in South Africa which indicate that there is no association between the level of knowledge, ICU training, years of experience and knowledge on prevention of VAP. (24)

In addition, a study conducted in Tanzania reveals that there is no significant association found between ICU training, level of education, years of working experience and knowledge. Practice

of ICU nurses on prevention of VAP was found to be statistically associated with education level but not statistically associated with ICU training and years of working experience.

This study also reveals that adequate ICU nurses‘ knowledge on VAP preventive strategies but knowledge did not reflect in their practice. Hand washing, environment and equipment cleanness during ETS and oral care was observed to be inadequate therefore knowledge of the ICU nurses on VAP preventive strategies does not necessarily reflect adequate practical skills, but knowledge remains the first step toward the implementation of the VAP preventive strategies (44).

CONCEPTUAL FRAMEWORK

The framework for this study entails the harmonious interaction between dependent and independent variables with a cherished Neumann‘s Intervention Theory. 1n 1982, Neumann proposed that nurses assist clients in retaining, attaining, and maintaining optimal stability by implementing prevention measures to decrease risk factors that allow stressors to invade the clients‘ defense system (62).

Neumann‘s system model provides a comprehensive flexible holistic and system based perspective for nursing practice. Neumann‘s model focuses on the response of the client‘s system to actual or potential environmental stressors and the use of primary, secondary and tertiary nursing prevention intervention for retention, attainment, and maintenance of optimal client health status (62).

Neumann‘s theory would support that one of many nursing intentions is to assist ICU patients by implementing effective VAP prevention measures. This framework was appropriate for the study because it provide guidance and support necessary during the literature review, development of study tool and discussion of the results.

In this study primary prevention was taken into account where nursing intervention and knowledge of what they intervene to prevent VAP occurrence to patients was assessed. Furthermore, nursing practices in relation to VAP prevention were assessed include hand washing, ETT suctioning and oral hygiene.

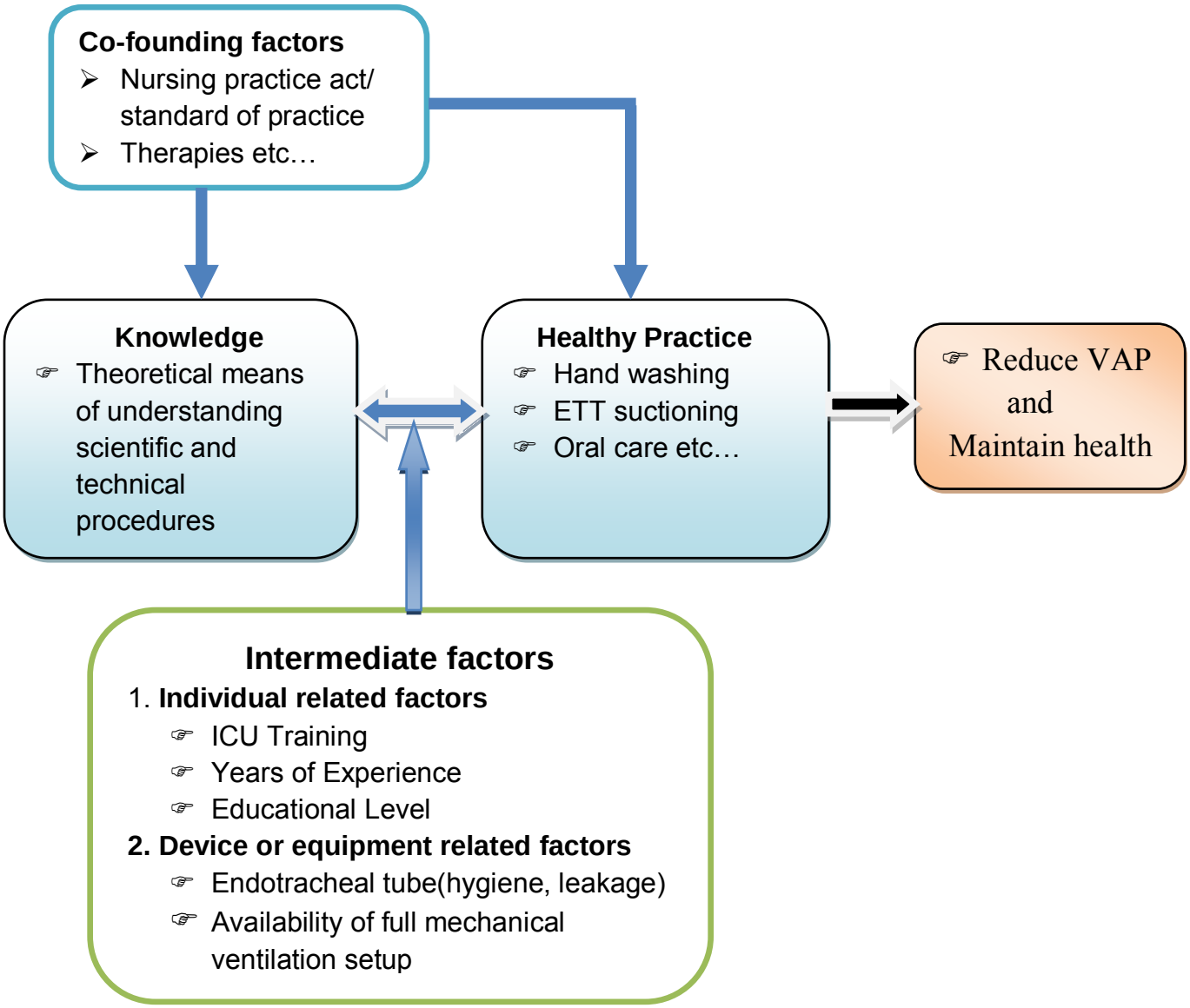

Figure 1: Showing the Conceptual framework

In Summary, this figure able to depicts that: Good/ adequate nurses knowledge and healthy practices can reduce the risk of acquiring Ventilator associated Pneumonia by exhibiting the intermediate and co-founding factors in its' constant and harmonious ways of interaction in a well equipped Intensive care environment can reduce Ventilator Associated Pneumonia(VAP) and Maintain health of the patient.

3. OBJECTIVES

3.1. General Objective

- To assess knowledge, practice and associated factors of Adult Intensive Care nurses‘ on prevention of Ventilator Associated Pneumonia in selected Hospitals in Addis Ababa, Ethiopia.

3.2. Specific Objectives

1. To determine level of knowledge of Adult Intensive Care nurses on prevention of Ventilator Associated Pneumonia
2. To assess practice of nurses‘ working in the Adult Intensive Care Unit on prevention of Ventilator Associated Pneumonia
3. To identify contributing factors associated with the development of Ventilator Associated Pneumonia with regard to nurses and nursing care.
4. To find out the association between selected socio-demographic factors (such as: year(s) of experience, educational level, ICU training) and Adult Intensive Care nurses‘ knowledge, and practice in preventing Ventilator Associated pneumonia (determined at $P_{Value} < 0.05$, 95%CI)

4. METHODS AND MATERIALS

4.1. Study Area

This study was conducted in Adult ICU of selected Hospitals in Addis Ababa, Ethiopia. Addis Ababa is the capital city of Ethiopia; covering an area of 540 sq. km and amongst others, she is the seat of the economic commission of Africa and Africa Union. The total population of the city is about 3.3 million with 5046 peoples per kilometer, more of slum and overcrowded. The Administrative region has 10 sub cities and 106 woredas' (districts). According to Addis Ababa health bureau report of 2010, there were 49 hospitals of which 13 are government owned, 5 NGOs and 31 are private, 27 public health centers, and 130 public health stations, 700 different levels private clinics are found in Addis Ababa city Administrative region (63). The study was conducted in purposively selected hospitals those have Adult Intensive care unit equipped with full mechanical ventilator setup and other aid materials.

4.2. Study Design and Study Period

Facility based descriptive cross-sectional and observational Study was conducted from March to May, 2014. A descriptive cross-sectional design is an observational study used where more information required in a particular field as it occur naturally and it is often the first step or initial enquiry in to a new topic, event, disease or condition (64). In this study, it was used to assess the knowledge, Practice and associated factors of Adult intensive Care nurses on prevention of VAP. Each subject was assessed at a single time in the study period. It consumes minimal time to obtain the association between variables under study.

Non-participant observational assessment method was used to gain insight into what was happening in to practice in case where observer is not included in the observation. Observational study method was involved in the collection of data that specify the behaviors/ practices or events

that was selected for observation and are conducted in participants‘ natural environments (65). Direct observation was potentially a more comprehensive method to ascertain how a nurse performs in real situations and to identify differences, if any, in practice.

4.3. Population

4.3.1. Source Population

All nurses working in the Intensive (critical) Care Unit in Addis Ababa, Ethiopia.

4.3.2. Study Population

Polit and Beck describe the study population as ~~t~~he entire aggregation of cases in which a researcher is interested in. This study was interested in nurses working in AICU in selected Hospitals in Addis Ababa, Ethiopia. There were about 180 nurses estimated to be working in the ICU (63).

4.4. Eligibility Criteria

4.4.1. Inclusion Criteria

1. Expert nurses working in the Adult ICU who consented to participate in the study
2. Nurses working in the Adult ICU who consented to participate in the study
3. Nurses working in the AICU for six months and above, as a probation period was over and a nurse was fully responsible to care for patients.
4. Trained nurses who consented to participate in the study.
5. Trained nurses registered by Ethiopian Nurses and Midwives Council, and or Association

4.4.2. Exclusion Criteria

1. All nurses who were not consented to participate in the study.
2. All nurses who were not at work place during data collection period (those in full time school schedule and those on leave).

4.5. Sample Size Determination and Sampling Technique

4.5.1. Sample size determination

The sample size for the study is calculated using Kish Leslie formula (64) as follows:

A single population proportion formula, $[n_o = (Z\ \alpha\ /2)^2 p\ (1\text{-}p)/\ d^2]$,

Where: n_o = Initial Sample size

Z = Standard normal deviation of 1.96 corresponding to 95% confidence interval

P= prevalence rate = ***0.5*** **(50%)**, because there was no well-established research finding in Ethiopia, which can serve as baseline information.

d= is a degree of accuracy of the results (Assumed marginal error), set at ***0.05*** is the standard allowed deviation from the true proportion.

Thus: $n_o = \dfrac{(1.96)^2 \times 0.5(1\text{-}0.5)}{(0.05)^2} = 384$ **N=***180* **(**Addis Ababa Health Bureau Report, 2012**)**

Since, the population is < 10,000; using correction formula

$n_f = n_o \times N / n_o + N$

$n_f = 384 \times 180 / 384 + 180$

$\mathbf{n_f =}$ ***122.6***

To adjust for non-responses 5% contingency of the calculated sample size added to the N as follows: 122.6 x 0.05= 6.13 then 122.6 + 6.13 = 128.7 Therefore, $\mathbf{n_f = 129}$ nurses. Hence, the minimum sample size required for this study will be **129** nurses.

4.5.2 Sampling procedure and Technique

A duty roster containing morning, afternoon and night shift was used in handling out a questionnaire to nurses working in the Adult ICU daily. However, there are few nurses working in the Adult intensive care unit, who met the criteria was included in this study. Out of 49 Hospitals in Addis Ababa, about 16 hospitals had well equipped Intensive Care Unit on which study was conducted, 8 hospitals had ICU but they do not have well equipped ICU with mechanical ventilator setup where as the rest 25 hospitals has no well-organized ICU, human power and mechanical ventilator setup in the department. Since the respondents are very small in number, all nurses working in the Adult Intensive care nurses were included in the study.

Purposive sampling was used to include those hospitals which had well equipped AICU, mechanical ventilator setup, human power (nurses working in the Adult intensive care unit) and currently functional was purposely selected to include all the participants. Purposive sampling is used when the study focusing on a limited number of informants, whom we select strategically so that their in-depth information will give optimal insight into an issue about which little is known (64). The following schematic representation shows the number of hospitals purposively selected based on availability of well-equipped ICU, mechanical ventilator setup and human power (number of AICN).

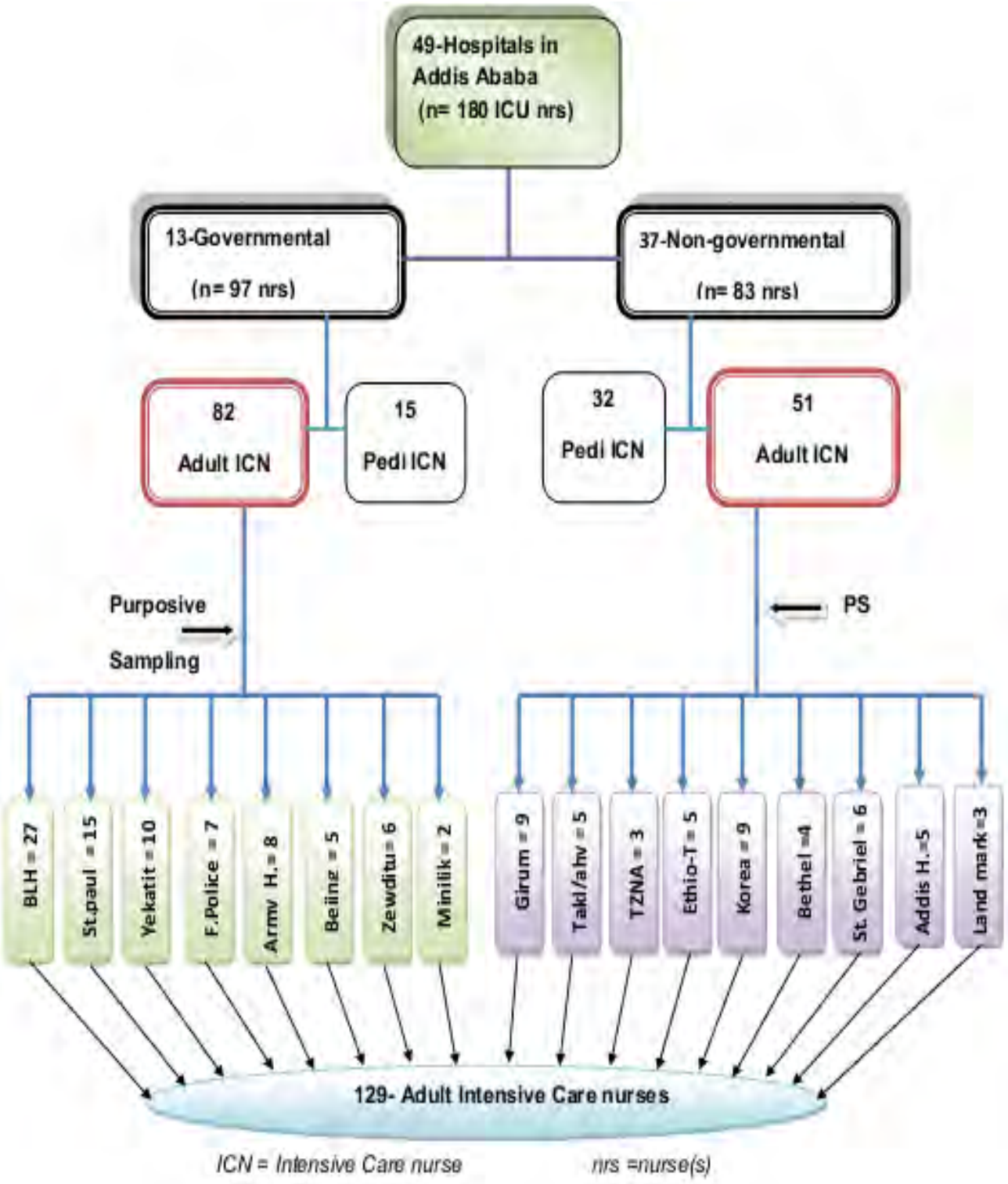

Figure 2: Shows the schematic representation of sampling procedure

4.6. Study Variables

4.6.1. Independent Variables

- ✓ Socio demographic factors (Age, Gender, Educational status, Marital status)
- ✓ ICU training
- ✓ Year(s) of working Experience in the ICU

4.6.2. Dependent Variables

- ✓ Knowledge of nurses in preventing VAP
- ✓ Practice of nurses in preventing VAP

4.7. Data Collection Procedure and Technique

4.7.1. Data Collection Tool

A questionnaire consists of part-I Questions used to assess on demographic information‘s and part-II with 20 questions which used to assess nurses level of knowledge and part-III, an observational checklist, used to assess the practice of intensive care nurses. Some of the questions were adopted from a reliable questionnaire developed by Vandijick29 (57) and from the same research done in Tanzania (41) and South Africa (24) but, modified according to Ethiopian context. Both adopted questions were again checked and assessed for their validity with the ICU experts and others were developed and added to the questionnaire for the purpose of this study.

An observational checklist is also adopted from similar researcher of the same research topic and integrated to our setting and context to find nurses‘ practice on hand washing, endotracheal suctioning and oral care as performed during the care of patients on mechanical ventilator guided by Centers for Disease Control and Prevention (66).

4.7.2. Data Collection and Quality Control

Before data collection, a pilot study was done in Black lion specialized Hospital on eight nurses working in the ICU on items in a questionnaire and observational schedule to identify practical or local problems that might be potentially affect the research process. Where as good rapport maintained in the whole period of data collection. As a result, some questions were omitted, some added and others rephrased. A standard questionnaire with information letter and a consent form attached to it will be handed out by two of my data collectors to nurses working in the AICU. A code number was used in a place of participant‘s name and an open code system for pilot study samples were used to exclude them from study samples. Nurses Participants was told to sign the consent form first and then provide them a self administered Questionnaire.

A questionnaire prepared in English language was used, since all nurses were learn (t) and trained in English. If some of the items in the questionnaire were not clear to few participants, questionnaires were filled in the presence of two well trained data collectors, and participants was free to ask questions or clarifications. Data collectors were trained nurses and volunteer expert nurse in an area. Questionnaires was filled in working hours; Consent forms and filled questionnaires was placed into sealed envelopes by the data collectors and taken from each unit daily. 10% of the collected data has checked by the supervisor daily for completeness and finally the principal investigator monitored the overall quality of data collection.

During Observational study, each participant‘s was observed for about 30min -1 hour; the time is selected randomly where data collector stays around ICU. Within this hour, nurses were expected to care patients in observed items. Nurses were not aware that they were being observed. The data collection was stayed from March to May, 2014 G.c.

4.8. Data Entry, Process and Data Analysis

Data was entered to Epi-Info version 3.5.4 and SPSS version 16.0 was the statistical programmer used to analyze the data. Data received from data collectors daily then cleaned and coded by the principal investigator. Data exploration was undertaken to see if there are odd codes or items that are not logical and then subsequent editing was made. The data was double entered to check the consistency and was cleaned and edited before analysis. Frequency distributions, figures and tables were used to provide an overall and coherent presentation and description of data. Multivariate regression tests was used to express the magnitude and direction of the association between education levels, years of working in ICU, ICU training and intensive care nurses' knowledge and practice on prevention of VAP. Participants cycled correct choices from a certain item was considered to have knowledge on that item. Participants who selected wrong choice from a certain item was considered to have no knowledge on that item (43).

4.9. Operational Definitions

- **Knowledge**: a theoretical understanding of measures to prevent ventilator associated pneumonia, according to the current study done in Tanzania, south Africa and Senegal ; a score of average and above average is considered adequate (9,13,39). Likely, in this study the knowledge refers to measurements of Adult Intensive Care nurses' response to 20 knowledge related questions. The correct response had the value of 1 and considered as having a knowledge on that item(s). Whereas, the incorrect response had the value of 0 and considered as having no knowledge on that item(s).By using the mean as a cut-off point; Respondents who score above the mean was considered as having adequate knowledge and those who score below the mean are considered as having inadequate knowledge.

- **Practice**: Implementations of fundamental measures of nursing standard of practice as they responds to 24 practice related questions on observational checklist that used to assess practice of nurses in preventing VAP (**yes**= following/ applying the recommended guidelines, **No**= those who do not do or not following/ behaving according to the recommended guidelines, as entailed on observational checklist)

- **Ventilator associated pneumonia**: is a type of pneumonia that occurs in the patient's on mechanical ventilator support by endotracheal tube or tracheostomy for more than 48 hrs with signs and symptoms of pneumonia.

- **Adult Intensive Care nurses:** Are nurses working in the Adult ICU whether they have a specialty or not.

4.10. Reliability and Validity

The modified questionnaires was handed to five experienced nurses working in the AICU to assess content validity of the questionnaire for its' adequate coverage of the content supposed to be assessed and extent to which the tools includes all the major elements relevantly assessed. The questionnaire comprises twelve validated questions; other questions were formulated by principal investigator with the help of ICU experts and reviewing multiple literatures to measure knowledge in various perspectives. Nurse experts involved in validation were excluded in the study.

Experts included in the validation were two local nurse experts experienced in the ICU and have research know-how, the ICU respiratory therapist, one registered nurse who have been working in the ICU for more than 10 years and one ICU nurse specialist. Nursing relevance of all items were assessed by scoring the items on a scale of 1 to 3:-

1 = not relevant; 2 = relevant, but not necessary; 3 = absolutely necessary in front of each question(s) and item(s). To ensure face validity; it was discussed if the questionnaire was clearly worded, well explained and if it addresses what it meant to address. The view points of the panel was considered, and all questions with its items were revised. After reviewing, the panel was agreed that items were clearly written and set for pretest.

To evaluate the level of difficulty of the questionnaire nurse experts working in the ICU was asked to answer the questionnaire and the proportion of respondents who answers the questions correctly was assessed.

Reliability was maintained by ensuring consistency and accurate record of data. Observation was employed only by trained data collectors to ensure consistency in scoring the observed practice and to avoid bias.

4.11. Ethical Consideration

The Thesis proposal was submitted to Department of Nursing and Midwifery, School of post graduate studies of Addis Ababa University Nursing Research Review Committee for approval. Followed the approval by IRB, Official letter of co-operation was written to the concerned bodies. Since; descriptive cross-sectional study was conducted integrated with observation on nurses during their practical session, and non-invasive data collection method employed on individual nurses, Thus they were not subjected to harm as far as the confidentiality is kept. A code number was used in a place of participant name and No personal identifiers was used on data collection form. The recorded data was not accessed by a third person except the principal investigator, and had kept confidentially.

4.12. Dissemination of Results

The Findings of this study will be communicated to the hospitals where the study was conducted and will be disseminated in each unit which participated in this study, to Addis Ababa Health Bureau to strengthening nurses level of knowledge and practice through training and education, to Addis Ababa University, Collage of Health Science, School of Allied Health Science, Post Graduate Program through soft and hard copy after presentation. The findings will be presented and or submitted to conferences, example Ethiopian Nursing Association, Symposium, or Workshops. Further, the results will be published for access to other users as well.

5. RESULTS

GENERAL CHARACTERISTICS OF THE STUDY POPULATION

Table 1: Proportion of Adult Intensive Care nurses according to their demographic characteristics in selected hospitals in Addis Ababa, 2014 G.c

Variables	Categories	Number (n=129)	Percent (%)
Gender	Male	51	39.5
	Female	78	60.5
Age	20-29	74	57.4
	30-39	43	33.3
	40^{+}	12	9.3
Educational level	Certificate	4	3.1
	Diploma	73	56.6
	BSc in Nursing	49	38
	MSc in Nursing	3	2.3
ICU Training	Yes	50	38.8
	No	79	61.2
Year(s) of working	<1 year	25	19.4
Experience	1-5 years	62	48.1
	6-10 years	35	27.1
	>10 years	7	5.4
Marital status	Single	70	54.3
	Married	59	45.7
Religion	Orthodox	77	59.7
	Muslim	21	16.3
	Protestant	24	18.6
	Catholic	6	4.7
	Other	1	0.8

Out of one hundred twenty nine respondents 78 (60.5%) were females, about 73 (56.6%) had Diploma. Majority of Adult Intensive care nurses 79 (61.2%) have no intensive care training, and 87 (67.5 %) are working in the ICU for less than 6 years. Majority of them 77 (59.7%) were orthodox in religion and 70 (54.3%) were single.

KNOWLEDGE SCORE OF ADULT INTENSIVE CARE NURSES IN PREVENTING VENTILATOR ASSOCIATED PNEUMONIA

Table 2: Showing the knowledge score of nurses working in the Adult Intensive Care Units in preventing VAP Addis Ababa, 2014 G.c

S.no	Knowledge questions	Yes	No	Score(s)	Freq
		Freq (%)	Freq (%)	Out of 20	(%)
1	Oral is the best recommended route of intubation	88(68.2)	41(31.8)	1	2(1.6)
2	Oral route is selected since it is not associated with sinusitis	77(59.7)	52(40.3)	3	1(0.8)
3	A nurse is required to dispose a suction catheter immediately after one single use	64(49.6)	65(50.4)	6	1(0.8)
4	It is recommended to change humidifiers every day, whenever necessary.	48(37.2)	81(62.8)	7	3(2.3)
5	Insertion of the suction catheter in to ETT is a sterile procedure	93(72.1)	36(27.9)	8	18(14.0)

6	Dusting of Respiratory and bedside equipment should be done every shift, whenever soiled.	32(24.8)	92(75.2)	9	24(18.6)
7	Head of the bed should be elevated from 30-45 degrees	74(57.4)	55(42.6)	10	17(13.2)
8	A nurse caring a ventilated patient is require to wear clean gloves during oral suctioning	77(59.7)	52(40.3)	11	21(16.3)
9	A nurse caring a ventilated patient is require to wash hands before and after oral/ ETT suctioning	106(82.2)	23(17.8)	12	14(10.9)
10	It is recommended to perform oral care every 4-6 hrs, whenever necessary using swab moistened with mouth wash and water	66(51.2)	63(48.8)	13	13(10.1)
11	Prolonged use of stress ulcer prophylaxis to a ventilated patient may increase the colonization density of the aero-digestive tract	40(31.0)	89(69.0)	14	6(4.7)
12	Maintenance of adequate number of nurse to patient ratio in critical care setting is associated with decreased risk of VAP	72(55.8)	57(44.2)	15	3(2.7)
13	Continuous education to ICU nurses on prevention of Nosocomial infection is associated with decreased rates of	91(70.5)	38(29.5)	16	1(0.8)

	VAP				
14	Chest physiotherapy is useful for decreasing risks for VAP	31(24.0)	98(76.0)	17	2(1.6)
15	Adjustable beds is useful for reducing the risks for VAP	102(79.1)	27(20.9)	18	1(0.8)
16	ETT suctioning should be done to patient as needed	49(38)	80(62)	19	2(1.6)
17	Eating on high calorie diet for patient on mechanical ventilation will reduce the risk for VAP	60(46.5)	69(53.5)		
18	Overfeeding of carbonated foods or fluids to a ventilated patient is associated with decreased risk of VAP	42(32.6)	87(67.4)		
19	During the care to a ventilated patient maintaining adequate cuff pressure is important because it decrease the risk for VAP	48(37.2)	81(62.8)		
20	Unplanned extubation is associated with increased risk of aspiration, therefore, increase the risk for VAP	105(81.4)	24(19.0)		
				Total	**129(100%)**

Mean score=10.58(52.9%)

LEVEL OF KNOWLEDGE OF ADULT INTENSIVE CARE NURSES IN PREVENTING VENTILATOR ASSOCIATED PNEUMONIA

Out of one hundred twenty nine Adult Intensive Care nurses, about 63 (48.8%) scores mean and above mean scores have adequate knowledge, where as 66 (51.2%) were scores below mean scores have inadequate knowledge(mean score=**10.58**(52.9%))

Figure 3: Showing Levels of Knowledge of Adult Intensive Care nurse in preventing VAP in selected hospitals in Addis Ababa, 2014 G.c

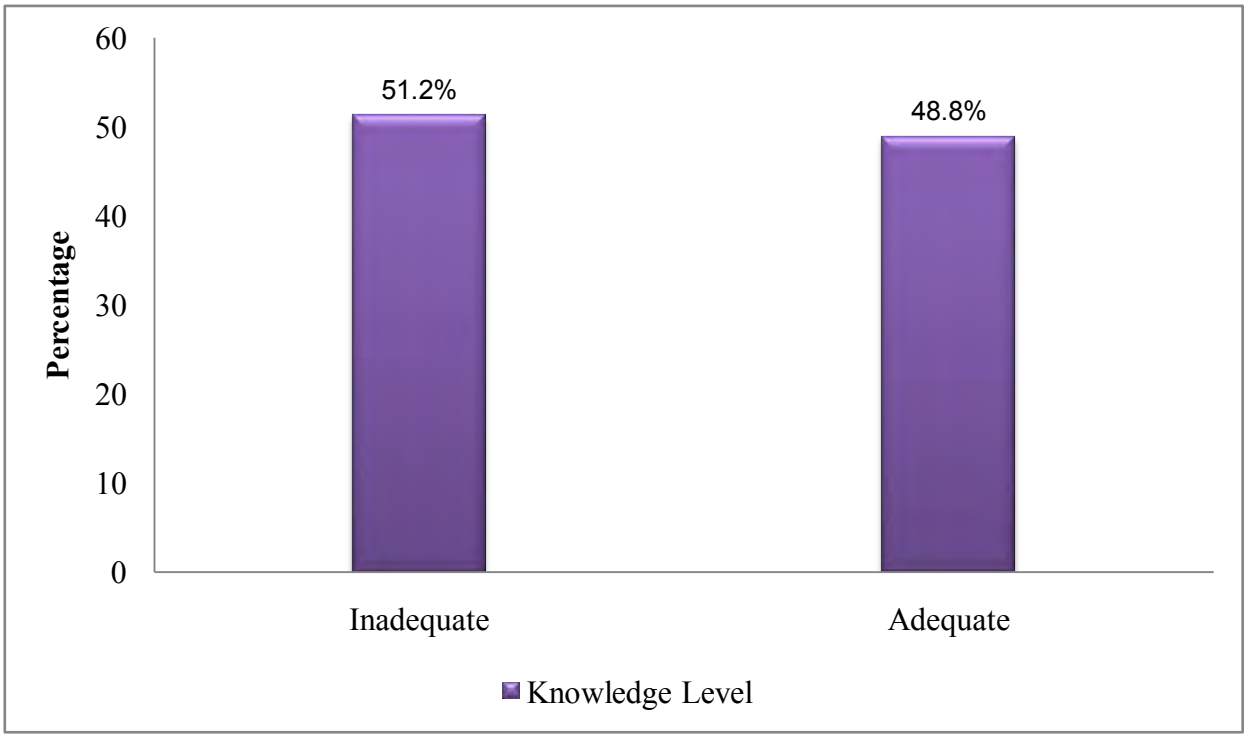

Figure 3: Showing Levels of Knowledge of Adult Intensive Care nurses in preventing VAP hospitals in Addis Ababa, 2014 G.c

PRACTICE OF ADULT INTENSIVE CARE NURSES

HAND WASHING PRACTICE

Large proportion of Adult Intensive Care nurses 55 (42.6%) observed are not wash their hands before entering ICU, 65 (50.4%) wash their hands before and 57 (44.2%) after patient contact. Large proportion of nurses 112 (86.8%) are observed to wash their hands after contact with a source of microorganism and also found that the use of alcohol rub is minimal 47(36.4%).

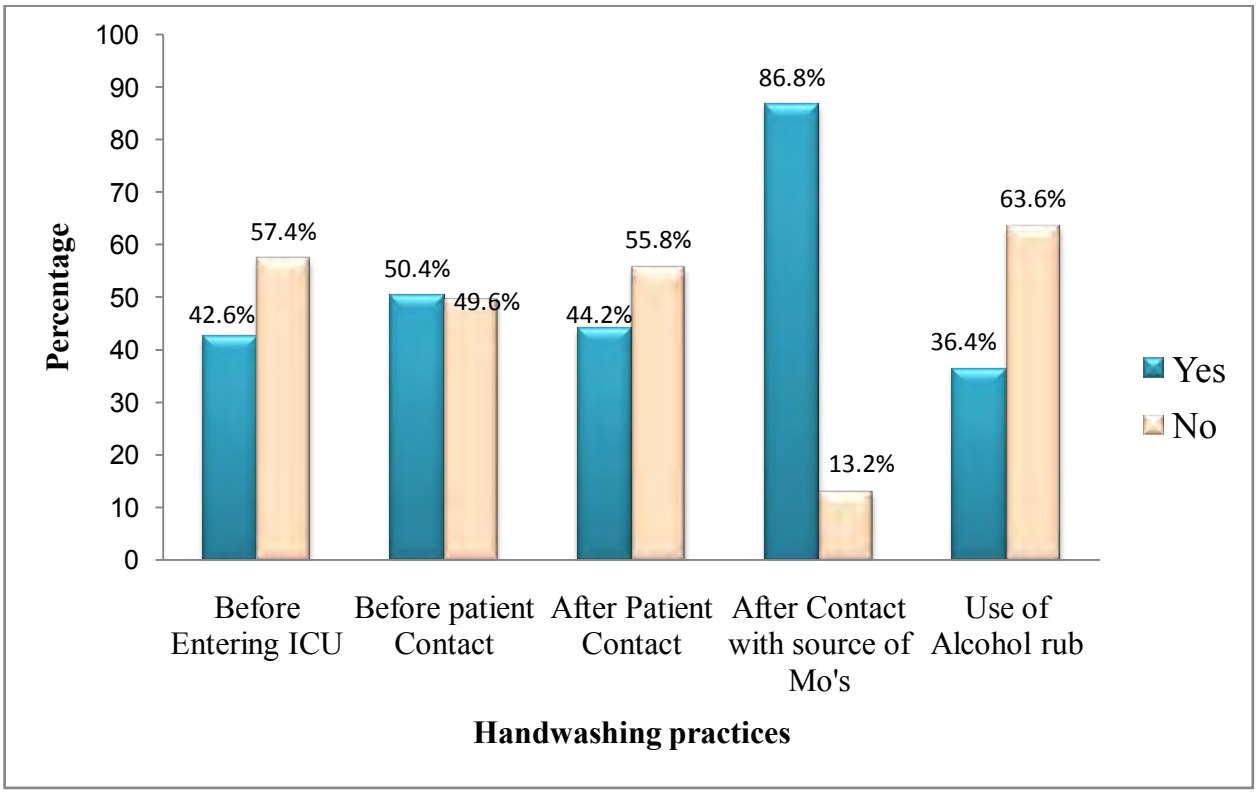

Figure 4: Showing Hand washing practices of Adult Intensive Care nurses in selected hospitals in Addis Ababa, 2014 G.c

SUCTIONING FROM THE ETT / TRACHEOSTOMY

Out of one hundred twenty nine Adult Intensive Care nurses, large proportion 117 (90.7%) of nurses worn sterile gloves though small proportion 58 (45%) practice hand washing before and 116 (89.9%) after suctioning, 45(34.9%) prepare sterile equipment and 78(60.5%) follow aseptic technique, whereas, 58(45%) Ensure environmental cleanness, 78(60.5%) discard suction tube immediately after single use, 75(58.1%) cannot measure the amount and characteristics of secretions and majority of nurses 76 (58.9%) also cannot document the procedure.

Table 3: Activities of Adult Intensive Care nurses during suctioning from ETT/ Tracheostomy in selected hospitals in Addis Ababa, 2014 G.c

Activities	Resp.	Freq.	%
Hand washing Before suctioning	Yes	58	45.0
	No	71	55.0
Wear sterile gloves	Yes	117	90.7
	No	12	9.30
Prepare Sterile equipments	Yes	45	34.9
	No	84	65.1
Ensuring environmental cleanness	Yes	58	45.0
	No	71	55.0
Insert the catheter in to the ETT gently by using aseptic technique	Yes	50	38.8
	No	79	61.2
	Yes	78	60.5
Discard suction tube immediately after one single use	No	51	39.5

Measure the amount and characteristics of secretion	Yes	54	41.9
	No	75	58.1
Hand washing after suctioning	Yes	116	89.9
	No	13	10.1
Documentation	Yes	53	41.1
	No	76	58.9

ORAL CARE PRACTICE

Of all nurses 118 (91.5%) can suction the secretion as they accumulate where as 49 (38%) wash their hands before oral care, and 127 (98.4%) wash their hands after oral care, 56 (43.4%) rinse mouth with clean swab and 24 (18.6) clean patients mouth using toothbrush or gauze moistened with mouth wash and 53(41.1%) position the patient in the semi recumbent position while small proportion 6 (4.7%) of nurses clean and return equipment to its proper places.

Table 4: Oral care Practices of Adult Intensive Care nurses in selected hospitals in Addis Ababa, 2014 G.c

Activities	Resp.	Freq.	%
Hand washing Before Oral care	Yes	49	38.0
	No	80	62.0
Apply clean gloves	Yes	11	8.50
	No	118	91.5
Position the patient in a semi recumbent	Yes	53	41.1
	No	76	58.9
		24	18.6
Clean mouth using toothbrush or gauze moistened with mouth wash	Yes		
	No	105	81.4

Rinse mouth with a clean swab	Yes	56	43.4
	No	73	56.6
Suction secretions as they accumulate, if necessary	Yes	118	91.5
	No	11	8.50
Apply water soluble jelly to patients lips	Yes	61	47.3
	No	68	52.7
Clean equipment and return to its proper place	Yes	6	4.70
	No	123	95.3
Hand washing after oral care	Yes	127	98.4
	No	2	1.60
Documentation	Yes	58	45.0
	No	71	55.0

Correct practice (yes) is only if it follows an acceptable evidence based practice protocol/guidelines

FACTORS ASSOCIATED WITH KNOWLEDGE

Adjusting for education, ICU training and years of experience in a multivariate logistic regression model reveal the following results; Correlation between level of education, ICU training, years of ICU working experience and knowledge of ICU. No significant difference in knowledge between participants with different years of experience as found ($p_{value} = 0.33$). There is a significant difference in Knowledge between respondents with ICU training as found (OR= 1.61, $p_{value} = 0.038$, 95%CI (1.02-2.56)) and between participants with different educational level (OR=1.87, $p_{value} = 0.04$, 95%CI (1.18- 4.45))

Table 5: Factors associated with knowledge of Adult Intensive Care nurses in selected hospitals in Addis Ababa, 2014 G.c (An association table)

Factors	Knowledge					
	Adequate (%)	Inadequate (%)	p-value (Bi)	COR(95%CI)	Pvalue (Multi)	AOR(95%CI)
ICU Training						
Yes	26(41.3%)	24(36.4%)	0.033	1.23(1.01-2.76)	**0.038***	1.61(1.02-2.56)
No	37(58.7%)	42(63.6)				
Experience						
5yrs and below	44(69.8%)	43(65.2%)	0.049	1.24(1.1-2.78)	**0.33**	0.97 (0.56-3.12)
6yrs and above	19(30.2%)	23(34.8%)				
Educational Level						
BSc & MSc	29(46%)	23(34.8%)	0.036	1.6(1.3- 4.4)	**0.041***	1.87(1.18-4.45)
Diploma & Certificate	34(54%)	43(65.2%)				

(*)= significant at p-value <0.05 Adjusted for ICU training, yrs of Experience and Edu. level

FACTORS ASSOCIATED WITH PRACTICE

Adjusting for level of education, ICU training and years of working experience as in a multivariate logistic regression model reveal the following results; Correlation between level of education, ICU training, years of working experience and practice of nurses working in the Adult Intensive care unit on prevention of VAP, there is no significant difference in practice between

ICU nurses with different educational Level as found (p_{value} = 0.55). Significant difference in practice was found between ICU nurses who had ICU training (OR= 1.39, p_{value} = 0.041, 95%CI (1.03-2.85)) and between nurses with different years of Experiences (OR= 19.2, p_{value} = 0.023, 95%CI (1.9-27.1))

Table 6: Factors Associated with practice of Adult Intensive Care nurses in selected hospitals in Addis Ababa, 2014 G.c (An association table)

Factors	Practice					
	Adequate (%)	Inadequate (%)	p-value (Bi)	COR(95%CI)	P-value (Multi)	AOR(95%C)
ICU Training						
Yes	4(6.2%)	46(70.8%)	0.57	0.028(0.01-2.09)	0.041*	1.39(1.03-2.85)
No	60(93.8%)	43(29.2%)				
Experience						
5yrs and below	59(92.2%)	28(43.1%)	0.00	15.6(1.4-24.1)	0.023*	19.2(1.9-27.1)
6yrs and above	5(7.8%)	37(56.9%)				
Educational Level						
Diploma & Certificate	40(62.5%)	37(56.9%)		1.26(1.06-3.3)	.55	.83(0.34-2.17)
BSc & MSc	24(37.5%)	28(43.1%)	0.034			

(*)= significant at p-value <0.05 by adjusted for ICU training, yrs of Experience and Edu.Level

6. DISCUSSION

One hundred and twenty nine nurses working in the Adult intensive care unit were recruited and all completed the study, 54.2% of nurses had diploma and below in nursing, majority 61.2% of ICU nurses had no intensive care training, and 95.6 % of nurses were working in ICU for less than 10 years. Lack of knowledge is said to be a barrier to practice, the knowledge scores and their levels were; 51.2% scored below average had Inadequate knowledge where as 48.8% of nurses scored mean score and above had adequate knowledge (mean value = 10.58 (53%)).

Nurses working in the ICUs of the three hospitals included in the study done in South Africa (38) only 23% have adequate knowledge on the evidence based guidelines for prevention of VAP. Also the questionnaire was distributed to 855 nurses during the annual congress of the Flemish Society for Critical Care nurses (25); Of 855 participants, 638 completed the questionnaire. Most 74.0% of respondents were females; about 57.0% were working in the ICU for less than 10 years of ICU experience (37).

Similarly, the study conducted in Tanzania on 118 ICU nurses were reveals that about 54.2% had either diploma in nursing, majority of ICU nurses 88.9% had no intensive care training, and 67.8 % were working in ICU for less than 10 years. Data collection tool in these two studies differ as the current tool have 20 items which measures knowledge while the south African study tool comprises of only 9 items this can contribute to the discrepancy in the findings (39,44, 48).

PRACTICE OF ADULT INTENSIVE CARE NURSES

HAND WASHING PRACTICE

Hand washing practice of nurses during their routine activities was expressed in percentages and number values. In this study, large proportion of Adult Intensive Care nurses 42.6% observed are not wash their hands before entering ICU, 50.4% wash their hands before and 44.2% after patient contact. Large proportion of nurses 86.8% were observed to wash their hands after contact with a source of microorganism and also found that the use of alcohol rub is minimal about 36.4%.

The study done in Tanzania was found that of the 30 nurses observed, none washed hands before entering the intensive care unit, only 16.7% had washed their hands before and 33.3% after contacting a patient; and 66.7% of these nurses, washed their hands after contacting with a source of microorganism like body fluid, 30% used antiseptic solution (chlorhexidine) or alcohol-based hand hygiene products after washing their hands (39, 43, 44,48).

This study report that large number of nurses 57.4% observed were not wash their hands before entering ICU. While it is recommended for health care workers including nurses to wash hands before entering intensive care unit. The observer associate absence of a tap and reagent for hand rub in the inlet door as a factor which hinder hand washing before entering to ICU; researcher perceives that dryness, irritation and fissures caused by soap or alcohol-based products may contribute to poor compliance to hand washing. It therefore suggested that the use of waterless alcohol gels may improve the hand hygiene of health care workers because these gels are less damaging to the skin and they efficiently and effectively remove transient flora from the hands. Hands should be washed soon after every contact with patients, the

materials around them and the secretions from the patient, and before and after invasive procedures whether or not gloves are used or changed.

Findings observed in this study shows that hand washing before patient contact was 50.4 % and 44.2 % after patient contact. With the application of multimodal intervention practices on nosocomial infection to the health workers, hand hygiene compliance was reported to increase from 40% to 53% before patient contact and from 39% to 59% after patient contact. In another study it was reported that hand washing rates were only 23% before patient contact and 48% after patient contact. Similar findings of a study done to HCW found that among HCWs (63), hand hygiene applications before patient contact were significantly worse than hand hygiene applications after patient contact. Hand washing hygiene is a cheap and primary infection control procedure therefore the researcher is suggesting the measure for improvement by continuous education during hand over of the shifts, seminar and posters, ensuring the availability of adequate hand washing utilities like soap, water taps, drying tissues and reducing work load by improving nurse to patient ratio.

SUCTIONING FROM THE ETT / TRACHEOSTOMY

Out of one hundred twenty nine Adult Intensive Care nurses, large proportion 117 (90.7%) of nurses worn sterile gloves though small proportion 58 (45%) practice hand washing before and 116 (89.9%) after suctioning, 45(34.9%) prepare sterile equipment and 78(60.5%) follow aseptic technique, whereas, 58(45%) Ensure environmental cleanness, 78(60.5%) discard suction tube immediately after single use, 75(58.1%) cannot measure the amount and characteristics of secretions and majority of nurses 76 (58.9%) also cannot document the procedure.

Study conducted in Tanzania Mohumbili National Hospital (43,44) shows that out of 30 nurses 33% wash hands before endotracheal suctioning (ETS), 66.7% maintain the sterility of the suction catheter until its insertion into the airway. 83.3% wear sterile gloves during suctioning. Only 33.3% participants washed their hands before performing ETS in contrast to 30% after performing ETS. Only 26.7% maintain cleanness of patient environment. (48, 63)

ICU infections are among the most common complications affecting ICU patients due to poor adherence to aseptic procedure like ETT suctioning. Application of aseptic technique in suctioning practices and hand washing before and after such procedures is strongly emphasized in the literature. In this study 55% of participants were not observed to wash hands before ETS procedure. Nurses observed not wash their hands before ETS as expected because of the time it takes out of a busy work schedule particularly, in high-demand situations, such as emergency, under busy working conditions and at times of overcrowding or understaffing. Notably, however, large number 90.7% of participants in this study were observed to wear sterile gloves.

This may suggest a perception among nurses that wearing gloves and using a ‗non-touch' aseptic technique when inserting the suction catheter negates the need for frequent hand washing yet the literature clearly suggests that gloves do not replace the need for hand washing.

These findings support earlier studies that report moderate and even low levels of adherence to recommended ETS procedure.

ORAL CARE

Of all nurses, 91.5% can suction the secretion as they accumulate where as 38% of nurses wash their hands before oral care, and 98.4% wash their hands after oral care and 91.5 % of nurses were fail to wear clean gloves during oral care procedures. 43.4% rinse mouth with clean swab and 18.6% clean patients mouth using toothbrush or gauze moistened with mouth wash, 47.3% apply water soluble jelly to patients lips and 41.1% position the patient in the semi recumbent position while small proportion 4.7% of nurses clean and return equipment to its proper places

The study done in Tanzania muhimbili National Hospital (43, 44) reveals that oral care practice observed, 33.3% nurses were their hands before and 43.3% wash their after oral care to a patient, 10% nurses fail to wear clean gloves during oral care, 30% nurses position a patient in a semi recumbent position during oral care. 80% use tooth brush or gauze moistened with either tooth paste or mouth wash antiseptics solution, 60% rinse patient mouth with clean swab, 50% do suctioning of secretions as they accumulate during the oral care, 26.7% apply water soluble jelly and 73.3% clean equipment and return it in a proper place (39, 48, 63).

Although the American Dental Association has no standards for the orally intubated patient, tooth brushing with toothpaste is recommended twice a day and swabbing the mouth every 2 to 4 hours, and this practice is now included in the oral care protocol (42).

However in the current study observer find using a toothbrush can be inadequate due to time-consuming and difficultness in manipulation of the endotracheal tube which limits access to the oral cavity and causes fear of potential dislodgement of the tube.

Oral suctioning and rinsing is indicated to prevent aspiration of oral care solutions during oral care.

In this study 91.5% of the nurses did suctioning of the oral cavity after tooth brush and 43.4% rinse patient mouth with clean swab while a patient positioned in a semi recumbent position to prevent back flow of oral secretion. Oral suctioning and semi recumbent positioning of the patient prevent aspiration which can cause VAP therefore nurses are expected to apply these measures to patients if no contraindication like in patients with head injury.

In the study observations, the researcher is in thought that the use of gloves replaced hand washing process this resulted in high expenditure of glove. It also create a sense of internal stigma to patients as some nurses observed to wear gloves during feeding a patient this couldn‘t be a case if nurses adhere to proper hand washing practice.

ASSOCIATED FACTORS

The current study found that knowledge of Adult intensive care unit nurses on prevention of VAP is statistically associated with ICU training and level of education p value < 0.05. However, their knowledge is not statistically significant with the educational level of nurses ($p_{value} > 0.05$). This is not similar with the findings of the global European study, South Africa and Tanzania which indicate that there is no association between ICU training, years of experience and nurses levels of knowledge on prevention of VAP.

Data from an Italian study carried out at Cisanello Hospital (13) indicated that nurses tend to apply measures automatically by simply following protocols and instructions given by physicians or colleagues without being fully aware of what and why they actually do. The same is true in this study which also identifies that the majority, 51.2% of nurses working in the Adult Intensive Care unit have inadequate knowledge and 51% of nurses practice on VAP preventive strategies; It was found not widely applied by nurses in a recommended manner. This can be

due to shortage of ICU nurses and lack of enough equipment therefore application of recommended practice during nursing intervention requires not only adequate knowledge but other associated factors have to be well addressed . The other is that nurses only wait physicians order than they practice what they know.

In addition to this, Most nurses practice nursing according to what they learned in nursing school as well as their experiences in practice. If one takes into consideration the number of changes that occur in nursing practice on a regular basis, it is essential to keep updated and have knowledge of the best current practice (9).

If nurses do not have enough knowledge on measures proven to decrease VAP rates they may not have the necessary confidence to take action and make decisions regarding such practices. Patient recovery may be delayed and increased risks of complications from mechanical ventilation such as VAP, which are risks that can be prevented.

STRENGTH AND LIMITATION OF THE STUDY

STRENGTH OF THE STUDY

- ✓ The first kind study conducted in Addis Ababa, Ethiopia.
- ✓ Withstand a lots of challenges (such as: repetitive appointment, plead and disregard as well as difficulty in contacting all organizational hierarchy, Identifying those hospital those had well-equipped ICU and those do not..etc)
- ✓ Since the study is quantitative, it minimizes subjectivity.
- ✓ Since standard questionnaire was used, it maximizes Validity.
- ✓ The response rate was 100%, which also maximizes the representativeness of the sample for the source population.

WEAKNESS / LIMITATIONS OF THE STUDY

- ☞ Though the study is the first kind study conducted in Addis Ababa, there are a few numbers of participants (Intensive care nurses in particular). This may threatens the external validity of the findings hence another country wide scale study (research) on this title is required with large sample size..
- ☞ Methodological Limitation; Observation, like other methods has its own limitations and ethical implications. One of the main problems is the effect of the _observer‘ on the _observed‘. This is referred to as the Hawthorne effect and is an important threat to the validity of observational research, where as participants‘ may aware of being in a study or Observation; it cause them to change their practice, Even though, the literature suggests that the change of behavior is usually temporary.

7. CONCLUSION AND RECCOMENDATION

7.1. CONCLUSION

This study found out that:

- Majority of Adult intensive Care nurses have inadequate knowledge.
- Nurses who trained and had high educational level had adequate knowledge than those nurses who had more years of experience.
- Those experienced and trained nurses were practicing more adequately than those nurses who had high level of education.
- Hand washing, environment and equipment cleanness during ETS and oral care was observed to be inadequate, therefore , knowledge of Adult Intensive Care nurses on VAP preventive strategies does reflect in inadequate practical skills.
- Nurses who hold their first degree were observed that they practice less likely than those trained and experienced diploma nurses.

IMPLICATION OF THE STUDY

The study inferred that the practice of the study subjects may compromise patient safety and conclude that the nurses working in the ICU had a knowledge deficits in major aspects of VAP preventive strategies, a fact that nurse practitioners, nurse educators, researchers and administrators ought to deserves investment regarding teaching /Education , research and nursing.

In general, the study implies that there were a lot of undone homework to nurse administrators, researchers, nurse educators and nurse practitioners that will implies more work needed on those activities used to upgrade nurses‘ knowledge and practice in bringing answer to knowledge - practice gap, field refinement and survive in the advanced technological competition of this era.

7.2. RECOMMENDATIONS

I would like to recommend:

- **Addis Ababa University**, College of Health Sciences, School of Allied Health Sciences: to open a specialty track in ―Intensive and Critical Care nursing," (if possible, within the coming five years) by formulating its own curriculum because there is no specialty field on which they specialize which may have a major contribution to inadequate knowledge and practice of the study subjects.
- **Addis Ababa Health Bureau**: to encourage nurses to follow strict acceptable evidence based practice protocol/ guidelines and provide them with guidebook, in service training and or education.
- **Hospitals on which the study was conducted**: to make an ICU environment enable nurses to translate knowledge into practice by ensuring availability of facilities like hand washing sinks, soap and disinfectants for cleaning and disinfecting equipments, adoption of acceptable guidelines based on evidence based practice protocol is also recommended.
- **Managers and Head (Matron) nurse(s) of the unit**: to motivate of opinion leaders amongst nurses in the units which promote cohesive and wormed interaction within the nurses that ease the way to put guidelines for prevention of VAP into- practice within in themselves . Besides, Learning resources such as articles, journals and electronic resources such as computers and internet should be made accessible in the units for staff members.

- **Nurse researchers**: to conduct country wide scale study on similar title to include large sample size , and further research on factors affecting implementation of VAP prevention strategies is recommended.

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APPENDIX-I : INFORMED CONSENT SHEET

1.English version

COLLAGE OF HEALTH SCIENCE, ALLIED SCHOOL OF HEALTH SCIENCES

DEPARTMENT OF NURSING AND MIDWIFERY

DIRECTORATE OF RESEARCH AND PUBLICATIONS, AAUMF

ID No: | | | | | | | | | | | |

Consent to participate in a project entitled Knowledge, practice and Associated factors of Adult Intensive care nurses on Prevention of Ventilator-Associated Pneumonia in selected Hospitals in Addis Ababa, Ethiopia

Greetings! My name is _____. I am a data collector avail to you as a research Assistant's on a behalf of principal investigator; on the thesis with the objective of identifying Knowledge, practice and associated factors of Adult Intensive care nurses on Prevention of Ventilator Associated Pneumonia.

Purpose of the Study

One hundred twenty nine (129) nurses working in the AICU will be enrolled to assess knowledge, practice and Associated factors of Adult intensive care nurses on prevention of ventilator associated pneumonia.

What Participation Involves

If you agree to join the study, you will be asked to answer 24 questions. The questionnaires consist of part-I with 4 questions on demographic information and part-II with 20 questions on VAP prevention strategies.

Confidentiality

All information collected on forms will be entered into computers with only the study identification number. All information that was collected from you will be protected. The study will not include details that directly identify you, such as your name. Only a participant identification number was used in the survey. Only a small number of researchers/ Research Assistants or data collectors would have direct access to the survey. If the results of the current study will be published or presented in a scientific meeting, names and other information that might identify you will not be used.

Risks/ Injury

The research team does not expect that any harm/injuries will happen to you because of joining this study.

Rights to Withdraw and Alternatives

Taking part in this study is completely your choice. You are free to skip any question if you feel uncomfortable to disclose information. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate, or withdrawal from the study, will not involve penalty or loss of any benefits to which you are otherwise entitled.

Benefits

There are no direct benefits to you; But, I hope that the results of the study will provide valuable information regarding knowledge, practice and Associated factors of nurses working in the Adult ICU on prevention of ventilator associated pneumonia and help to focus on nursing education and training as well as continuing development of intensive care nurses knowledge and practices.

Who to Contact

If you ever have questions about this study, you should contact the principal investigator **Girma Alemu Wami** (+2519-19-40-56-87) Addis Ababa University, Collage of Health Science, Allied School of Health Sciences, Department of Nursing and Midwifery, Addis Ababa).

Do you agree to participate? Yes No

Participant agrees ……. (Continue to sign below and fill questionnaire)

Participant does NOT agree ….. (Stop continuing!)

I have read the contents in this form. My Questions have been answered. I agree to participate in this study.

Signature of participant _____

Signature of the Research Assistant (Data collector) _____

Date_____

Thank you!

2.Amharic version

ጤና ሳይንስ ኮሌጅ

ነርሲንግ እና የሚድዊፈሪ ትምህርት ክፍል

መ.ቁ፡ | | | | | | | | | | |

መግቢያ

ጤና ይስጥልኝ! ስሜ ----------

እኔ በአዲስ አበባ ዩኒቨርሲቲ የጤና ሳይንስ ኮሌጅ ነርሲንግ እና የሚድዊፈሪ ትምህርት ክፍል በ **ግርማ አለሙ ዋሚ** በሚካሄደው ጥናት ላይ በጊዜያዊነት ተወከዬ ነው ይህን ጥያቄ ና መልስ ይገፎ የመጣሁት፡፡ ይህ ጥናት በ ሆስፒታሎች ዉስጥ የ ሰዉ ሰራሽ ትንፋሽ መርጃ መሣሪያ ተያያዥ ሳምባምች በሽታን(VAP) ለ መከላከል ነርሶች ያለቸዉን ግንዛቤ እና አተጋባበረቻዉን እንድሁም ነርሶችን ተየየዥ የሆኑ ጉዳዮችን ለመፈተሽ ነው፡፡

ይህ ጥናት ከነርሶች ጋር በቀጥታ የተያያዘ ስለመሆኑ በጥናቱ እንዲሳተፉ ከተመረጡት አንዱ እርሶዎት፡፡ ስለዚህ እዚህ ጥናት ላይ እንዲሳተፉና አስፈላጊ መረጃ እንዲሰጡን በትህትና እንጠይቃለን፡፡

ይሁን እንጂ ማንኛውንም ጥያቄ አለመመለስ ይችላሉ፡፡ እንዲሁም በማንኛውም ጊዜ ጥያቄውን ማቋረጥና በጥናቱ አለመሳተፍ ይችላሉ፡፡ በጥናቱ ባለመሳተፎ ማግኘት ከሚገባዎት አገልግሎት ከማግኘት አያግዶትም፡፡ ጥያቄና መልሱ 20 ደቂቃ ይወስዳል፡፡ ይህ በግልዎ የሚሰጡት መልስም በሚስጢር የሚጠበቅ ስለሆነ ከጥናቱ ውጤት ጋር በምንም

የሚያያዝ አይደለም፡፡ ላረጋግጥልዎ የምፈልገው ግን ይህ የሚሰጡት መልስ በጣም አስፈላጊ የሚሆነው ጥናቱን ለማጥናት ብቻ ሳይሆን ሰዉ ሰራሽ ትንፋሽ መርጃ መሣሪያ ተያያዥ ሳምባምች በሽታን(VAP) ችግር ለመፍታት እንዲሁም በሽታውን ለዘለቄታው ለማስወገድ የሚረዱ እቅድ ለማውጣት እና በተግባር ለማዋል እንዲሁም ህሙማን በ ሰዉ ሰራሽ ትንፋሽ መርጃ መሣሪያ ተያያዥ ሳምባምች በሽታን አስመልክቶ በርሶ በኩል የሎትን ግንዛቤን ና አተጋበበር ዙሪያ የሚጠቅም አስተያየት ለማግኘት ነው፡፡

በመጥይቁ መሳተፍ ፍቃደኛ ነዎት? አዎ……..ይቀጥሉ

አይደለም……..…….ያቁሙ

ተጠያቂ ፍቃደኛ ካሌሆኑ አመስግነው ያሰናብቷቸው ፤ ፍቃደኛ ከሆኑ ግን የሚከተለትን ጥያቄዎች ይጠይቋቸው፡፡

1. የጤና ተቋሙ ስም _____

2. ቀን _____/_____/_____

3. የጥያቄ ወረቀቱ መለያ ቁጥር _____

4. የመረጃ ሰብሳቢ ስምና ፉርማ_____

5. የተቆጣጣሪ ስምና ፉርማ _____

አመሰግናለሁ!!!

APPENDIX –II : QUESTIONNAIRE

INFORMATION SHEET

This information collection sheet is intended to assess knowledge, practice and associated factors of Adult intensive care nurses on prevention of ventilator associated pneumonia in selected hospitals in Addis Ababa, Ethiopia.

The study will be conducted by **Girma Alemu Wami** who is second year Advanced Adult Health postgraduate student in Addis Ababa University. The study will be conducted through self-administered structured questionnaires and using observational checklist. The study will give evidence for those program officers, governmental and non-governmental organizations which work in an area of increasing ICU nurses knowledge and practice in preventing or reducing ventilator associated pneumonia. Since the study will be conducted through self administered questionnaires and non invasive data collection methods; the individual nurses will not be subjected to any harm as far as the confidentiality is kept and no personal identifiers will be disclosed.

It will take **20 minutes**.

Are you voluntary to participate? **Yes** **No**

Time started _____Time ended_____ Date (DD/MM/YY) _____

Name of data collector _____Signature_____

Name of the hospital: _____

Name of supervisor_____ Signature_____

Principal investigator: **Girma Alemu Wami** Address: +2519-19-40-56-87

Part-I: socio-demographic characteristics of Adult intensive care nurses

Gender: Female ☐ Male ☐ **Age** ☐ **Education level**: _____**Code no**.____

ICU Training: yes ☐ No ☐ **Marital Status**: _____**Religion** _____

Years of work experience as a critical care nurse? <1year ☐ 1-5 years ☐ 6-10yrs ☐

>10 years ☐

Part –II: Assessing Adult Intensive Care nurses knowledge on Prevention of Ventilator Associated Pneumonia

1. Which route is best recommended when intubating a patient?

a. Oral intubation is recommended
b. Nasal intubation is recommended
c. Both routes of intubation are recommended
d. I do not know

2. The recommended route of intubation in Qn.1 will decrease the risk of VAP because

a. It is associated with sinusitis
b. It is not associated with sinusitis
c. Both routes of intubation are associated with sinusitis
d. I don‘t know

3. A nurse is required to dispose a suction catheter

a. immediately after one single use
b. can be cleaned and used twice
c. can be used without being cleaned
d. I don‘t know

4. **It 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
5. **Insertion of the suction catheter into the endotracheal 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.
6. **Dusting of respiratory and bedside equipment with antiseptic should be done**
    a. Every shift and whenever soiled.
    b. Whenever soiled.
    c. Weekly.
    d. I do not know
7. **Head of the bed elevation should be ranging from**
    a. 0-15 degree
    b. 15-30 degrees
    c. 30-45 degrees
    d. I do not know
8. **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

9. 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

10. It is recommended to perform Oral care by using a swab moistened with mouthwash and water

a. once in a shift

b. every 4 to 6 hours and whenever necessary

c. whenever necessary

d. I do not know

11. 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. I don‘t know

12. Maintenance of adequate number of nurse to patient ratio in critical care setting 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

13. Continuous education to ICU nurses on prevention of nosocomial infection is associated with:

a. Increased rates of VAP

b. Decreased rates of VAP

c. Does not influence the rates VAP

d. I don‘t know

14. It is important to perform chest physiotherapy due to the following reason

a. Chest physiotherapy reduce the risk for VAP

b. Chest physiotherapy increase the risk for VAP

c. Does not influence the risk for VAP

d. I do not know

15. Adjustable beds are useful in critical care setting because

a. Adjustable beds increase the risk for VAP

b. Adjustable beds reduce the risk for VAP

c. Adjustable beds have no influence upon the risk for VAP

d. I don‘t know

16. ETT suctioning should be done to patient

a. Routinely to every shift.

b. As needed

c. It should be done through ETT only.

d. I do not know

17. Eating on high calorie diet for a patient on mechanical ventilation will

a. reduce the risk for VAP

b. increase the risk for VAP

c. do not influence the risk for VAP

d. I don‘t know

18. Over feeding of carbonated foods or fluids to a ventilated patient is associated with

a. increased the risk for VAP

b. decreased the risk for VAP

c. do not influence the risk for VAP

d. I don‘t know

19. During the care of ventilated patient maintenance of adequate cuff pressure

a. Is important because it decrease the risk for VAP

b. Can increase the risk for VAP

c. Do not influence the risk for VAP

d. I don‘t know

20. Unplanned extubation is associated with increased risk of aspiration therefore

a. Increase the risk for VAP

b. Decrease the risk for VAP

c. Do not influence the risk for VAP

d. I don‘t know

APPENDIX- III : OBSERVATION CHECKLIST

Mark using _**x**‘ or √ in the box provided

Gender: Female ☐ Male ☐ **Age** ☐**Education level**: _____**Code no**.___

ICU Training: yes ☐ No ☐ **Marital Status**: _____ **Religion** _____

Years of work experience as a critical care nurse? <1year ☐ 1-5 years ☐ 6-10yrs ☐

>10 years ☐

Start time of observations_____ **End time of observations**_____

Part III: Observational check list on ICU nurses practice on Prevention of VAP

PREVENTION PRACTICE	**YES**	**NO**
Hand washing		
Hand washing before entering ICU		
Before patient contact		
After patient contact		
After contact with a source of microorganisms		
Use of alcohol rub		
Suctioning from the ETT/tracheotomy		
Hand washing before suctioning		
Wear gloves		
Prepare sterile equipments required during suctioning		
Insuring environmental cleanness		
Insert the catheter into the ETT gently by using aseptic technique		

Discard suction tube immediately after one single use		
Measure the amount and characteristics of secretion		
Hand washing after suctioning		
Documentation		
Oral care		
Hand washing before oral care		
Apply clean gloves		
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 patient‘s lips		
Clean equipment and return it to its proper place		
Hand washing after oral care		
Documentation		

APPENDIX IV: MAP OF ADDIS ABABA

Figure 5: Map of Addis Ababa, Ethiopia, created on 20th December, 2013 G.c

DECLARATION

I, **Girma Alemu Wami**, the undersigned declare that this is my original work and has not been presented in this or any other University for a similar or any other degree award, and any partial or full sources of materials used should be fully acknowledged.

Name: **Girma Alemu** (BSc)

Signature: _____

Date: _____

This thesis has been submitted for certification to:

Advisor: Daniel Mengistu (BSc, RN, MSc)

Signature: _____

Date: _____

Place: Addis Ababa University College of Health Sciences, School of Allied Health Sciences Department of Nursing and Midwifery, Post Graduate program.