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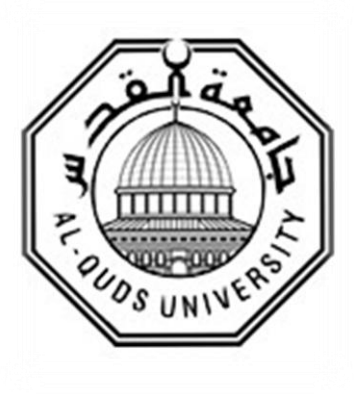

Determinants of Ventilator-Associated Pneumonia among Neonates-Gaza Governorates: (Cross-Sectional Study)

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Determinants of Ventilator-Associated Pneumonia among Neonates-Gaza Governorates (Cross-sectional Study)

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Dedication

I dedicate this effort to the great father who devoted this life for us.

To my dear mother that gave me the road of my success.

I dedicate it to my life partner and dear wife

To my brothers, and all my relatives who encouraged me to complete this work.

To the Palestinian people especially for martyrs who sacrificed their lives for Palestine and Al-Aqsa.

To my friends for their support and continual help.

AbedallaRafek Mahdi

Date: 23/12/2017

Declaration

I certify that this research submitted for the degree of Master is the result of my own research, and that this thesis (or any of its parts) has not been submitted from any other previous works to any other university or institution.

Signed

AbedallaRafek Mahdi

Date: **23/12/2017**

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Abstract

Ventilator- Associated Pneumonia VAPthat occurs in a patient connected to mechanical ventilation which develops 48 hours or more after initiating mechanicalventilation. The most common determinants of VAP in neonatal intensive care unit NICU are leukocytosis or Leukopenia, metabolic acidosis, Endotracheal Intubation ETT, re-intubation, and contaminated intensive care unit ICU environment with lack of infection control measures, administration of blood products, enteral feeding, , prematurity, invasive devicesand low birth weight. This study isa cross sectional studycontainstwo direct observation checklists designed by the researcher.The first observation consisted of 102 neonates(known by the first observation checklist made by the researcher) that admitted to NICUdistributed in four hospitals (AL- shifa Hospital "47",AL-TahreerHospital"25", Al-Naser pediatric Hospital "21", and finally European Gaza Hospital EUG"9") during 100 days (period of data collection) and diagnosed with VAP. The study was conducted in the period from the first of May 2016 to the 10thof August 2016. The result of VAP developed in 43 of 102 ventilated neonates (42.2% VAP incidence) shows that significant common determinates for positive VAP were: longtime of intubation (X^2= 21.020; P-Value= 0.000);ETT change times (X^2= 6.847; P-Value= 0.033); Ryle tube (X^2= 10.551; P-Value= 0.001);urinary catheters (X^2= 23.287; P-Value= 0.000); umbilical line catheter ULV (X^2= 49.251; P-Value= 0.+000); chest tube (X^2= 29.551; P-Value= 0.000); Administration of blood products such as plasma and packed red blood cells RBS (39.5%), plasma & human albumin &packed RBS (11.6%) then packed RBS (11.6), and finally plasma (4.7%) (X^2= 14.989; P-Value= 0.000).Blood culture resultsshow thatAcinetobacter (48.8%),Klebsilla (30.2 %),Pseudomonas (11.6%), and Candida (7.0%) Coagulase- negative staphylococci (2.3%) (X^2= 54.830; P-Value= 0.000).Mode of delivery resultsshows thatcesarean sectionCS and normal spontaneous vaginal delivery NSVD (X^2= 0.220; P-Value= 0.008). The second observation was designedto observe four hospitals (AL- shifa Hospital"12", AL-TahreerHospital "5", Al-Naser pediatric Hospital"10", and finally EUG "3"). For hand washing, the results show that (F = 24,807; P-Value= 0.000); disinfectant tools of ETT (F = 28.539; P-Value= 0.000); infection control procedures for the Suction process (F = 10,851; P-Value= 0.000); infection control Polices (F = 5,774; P-Value= 0.004); andinfection control Kits (F = 1.717; P-Value= 0.188).In conclusion, the mostimportant determinants of VAP are: prolonged period of intubation, placementULV,chest tube, inserting Ryle feeding, electiveCS delivery, transfusion anycomponent of blood transfusion and re-intubation ETT. Ifthese determinants are avoided or decreased, thiswill help in reducing the morbidity and mortality in neonates with VAP inGazagovernorates (GG).Moreover, Blood cultures have value in microbiological diagnosis of VAP among neonates butit was foundthat there were not the same microorganisms isolated fromBronchoalveolar LavageBAL culture.

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List of abbreviations

AAP	American Academy of Pediatric
ABGs	Arterial Blood Gases
BAL	BronchoalveolarLavage
BSI	Blood Stream Infection
CDC	Center for Disease Control and Prevention
CPAP	Continues Positive Airway presence
CRP	C-Reactive Protein
CS	Cesarean Section
CVC	Central Venous Catheter
DAI	Devises Association Infection
EGA	Estimated Gestational Age
ELBW	Extremely Low Birth Weight
ETT	Endo- Tracheal Tube
GBS	Group B Streptococcus
GG	Gaza Governorates
GNN	Gaza Neonatal Network
HAI	Healthcare Associated Infection
ICU	Intensive Care Unite
IUGR	Intra-Uterine Growth Retardation
LBW	Low Birth Weight
LOS	Late Onset Sepsis
MAS	Meconium Aspiration Syndrome
MDR	Multidrug Resistant

MOH	Ministry Of Health
MV	Mechanical Ventilator
NB-BAL	Non-BronchoscopicBronchoAlveolarLavage
NICU	Neonatal Intensive Care Unit
NMR	Neonatal Mortality Rate
NNIS	National Nosocomial Infection Surveillance
NP	Neonatal Pneumonia
NVSD	Normal Spontaneous Vaginal Delivery
PA	Posterior Anterior
PPHN	Persistent Pulmonary Hypertension of the Newborn
RDS	Respiratory Distress Syndrome
SGA	Small for Gestational Age
UC	Umbilical Catheter
ULC	Umbilical Line Catheter
UNCEF	United Nations Children's Emergency Fund
UVC	Umbilical Vein Catheter
VAP	Ventilator Association Pneumonia
VLBW	Very Low Birth Weight
WB	West Bank
WHO	World Health Organization

Chapter (1) Introduction

1.1 Background:

Ventilator- Associated Pneumonia (VAP), as defined by the Centers for Disease Control and prevention (CDC), is a pneumonia that occurs in a patient connected to mechanical ventilation which develops 48 hours or more after initiation of mechanical ventilation (Nemat et al, 2015).VAP comes in the second stage as the most popular nosocomial infection through both pediatric and NICU patient (Foglia et al, 2007).VAP is classified into two categories, the first category is called early-onset VAP which is defined as pneumonia occurring within the first 5 days of mechanical ventilation. This category is most often antibiotic sensitive bacteria (e.g. oxacillin sensitive staphylococcus aurous, homophiles influenza, and streptococcuspneumonia). Then, the second category which is called late-onset and defined as pneumonia occurring more than 5 days of mechanical ventilation, this category occurs as a result of antibiotic-resistance pathogens (e.g. oxacillin-resistance staph aurous, pseudomonas, aeruginosa, acinetobacter species, and enterobacter species) (Tang et al, 2009;Kollef et al,2015).

The criteria used to diagnose VAP in neonates include mechanical ventilation within 48 hours of onset of suspected VAP, worsening gas exchange with an increase in oxygen or ventilator requirement,two or more chest radiographs that show new infiltrates, consolidation, cavitations, or pneumotoceles, and at least 3 signs and symptoms. Signs and symptoms may include temperature instability, wheezing, tachypnea, cough, abnormal heart rate, change in secretions, or abnormal leukocyte count. The criteria have not been validated in neonates, and they are often open to subjective interpretation because they overlap with other disease (Badr et al, 2011).

The diagnosis of VAP is a clinical suspicion. The most accepted clinical definition for suspicion of pneumonia is currently the present of pulmonary infiltrate on chest radiograph

plus two of the following three criteria: leukocytosis or Leukopenia, purulent respiratory secretions and hyperthermia or hypothermia (Fathy et al, 2013).

The impacts of VAP are very important to be considered in the developing countries, while most of VAP studies were performed in developed countries. VAP is considered as a critical infection in health care since it results in high morbidity and mortality. Moreover it increases the duration of stay in hospital and rises up the costs of hospital. In developing countries, the measures used in preventing ventilator associated pneumonia are rarely recorded. Compared with adults, elder children, the neonate varies in anatomy, physiology, underling disease, and invasive procedures. We need urgent studies to evaluate the effectiveness of (VAP bundles) in NICU. The reports which are used in developing countries to measures success VAP intervention strategies; especially among neonates are rare (Azab et al, 2015).

The pathogenesis of VAP goes through two stages the first stage is the bacterial colonization of the aerodigestive tract, the second stages occurs in the aspiration of contaminated oral secretions in the lower air ways because Endotracheal Tubes used to ventilate neonates are not cuffed (Badr et al, 2011).

There is a probability from 6-20 of pneumonia to be required by the patients who need mechanical ventilation on the other hand patient who don't require mechanical ventilation have lower probability of pneumonia infection occurrence (Tang et al, 2009). Recent studies have illustrated that the recurrence of VAP after cardiac surgery goes between 7% to 9% in adult patient and 9%to21% in pediatric. Patients in addition it leads to morbidity and mortality (Tang et al, 2009).

The most common risk factors of VAP in NICU are leucopenia, thrombocytopenia, high C-reactive protein (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, coma, use of sedatives/analgesics, administration of blood products, enteral feeding, low birth weight, prematurity and invasive devices (Badr et al, 2011; Fathy et al, 2013; Aelami et al, 2014).

1.2 Research problem:

Globally, the incidence of VAP in the USA ranges between 9-27% whereas in Egypt the incidence of VAP takes the range between 16-75%. According to the previous data, the incidence of VAP in developing countries is about 2.5 times higher than in the developed countries. So the daily risk of VAP in developed countries ranges from 1%-3% (Fathy et al, 2013).

Based on what the researcher noticed; there are many cases of NICU attending governmental hospitals due to VAP after connected to mechanical ventilator for more than 48 hours, those neonates are admitted to neonatal intensive care units (NICU) for several reasons, so the researcher found a need for determining the risk factors that lead to increasing the incidence of VAP in (GG). There is currently limited information about determinates of neonatal VAP in GG and this study will be the first to shed light on the role of VAP on neonatal morbidity and mortality in GG.

1.3 Justification of the Study:

The neonatal period "the first 28 days of life" is a highly vulnerable period during which many of physiological adaptations required for extra-uterine existence are completely found. Neonates in this period are susceptible to be infected due to his\her immature immune system. The inability of neonates to adjust with the extra uterine life or the infection of any infectious disease can lead to different health problems; one of the most common health problems in NICU is VAP.

According to many previous studies.There were no proper reporting systems for VAP in the developing countries, while most of reporting systems were found in the developed counties.

Therefore, the researcher is interested in studying VAP in neonates ICU in GG to investigate the common determinants for VAP. Investigating determinates associated with VAP in neonates ICU is important in resolving this critical problem. Lack of studies concerned with VAP also motivates the researcher to highlight this problem in attempt to help in resolvingit.

1.4 Study objectives

1.4.1 General objective:

The objective of this study is to assess the main determinates that bring about the development of VAP among neonates in GG. Thus, the study findings may contribute in assessing determines rate of neonatal VAP in ICU in Gaza governorates.

1.4.2 Specific objectives:

- To determine the incidence of VAP among neonates in GG.
- To verify the relationship between invasive procedures and neonatal VAP.
- To identify the most common determinants of VAP that haseffects on neonates.
- To suggest recommendations for actions that could be taken to reduce the impact of VAP on neonate's health in ICU in GG.
- To assess the relationship between committing to principles of infection control in NICU and the development of VAP in neonates.

1.5 Research questions:

- Does VAP affect preterm neonates only or could affect full term and post term neonates?
- What is the most common causative type of bacteria from BAL culture among neonates?
- Is there an association between certain sensitivity BAL cultures laboratory results and occurrence of VAP?
- Does VAP effect on low birth babies only or could affect normal birth weight babies?
- What is the relationship between VAP and ETT re-intubation?
- Is there a relationship between VAP and the use of the Ryle tube feeding in neonate?
- Is there a relationship between VAP and insertion of umbilical line?
- Is there a relationship between VAP and use the urinary catheterin neonate?
- Is there a relationship between VAP and use the chest tubein neonate?

1.6 Context of the study

1.6.1 Gaza Governorate demographic characteristics

Palestine is an Arabic Country, relatively small one, the total surface area of the historical Palestine is about 27.000 Km², Palestine has been occupied in1948 by Israel and the two remaining parts are separated geographically (West Bank and Gaza Strip) after the war in 1967. The total area of the Gaza Strip (365Km²) and West Bank (5655 Km²) is about 6,020 Km²with total population living in is about 4,616,418individuals (1.790.010 in GS and 2.826.408 WB). GS is a narrow piece of land lying in the coast of Mediterranean Sea, The total area of GS is about 365 Km², GS is overcrowded area with population density of 4904 inhabitants/ Km²q (PCBS, 2014; MOH, 2014$_A$).GS is divided into five governorates: Gaza Governorate, North Governorate, Mid-zone Governorate, Khan-Younis Governorate,

and Rafah Governorate (MOH, 2014_B).According to the annual report of Ministry of Health in 2014, the crude birth rate (CBR) in the Palestinian territory was estimated about 26.7/1000 of population in 2014; distributed as 23.6/1000 in the WB and 31.6/1000 in GS, on the other hand the crude death rate (CDR) was about 3.1/1000 of population; distributed as 3.8/1000 of population in GS and 2.6/1000 in WB, also the infant mortality in 2014 was 14.3/1000 per live births in Gaza strip(MOH, 2014_C).

Moreover generally the Low Birth Weight less than 2500g was slightly enhanced from 6.8% in 2013 to 6.3% in 2014; the babies who weigh less than 1500g decreased from 1,3% in 2013 to 0,4% in 2014; the babies who weigh between (1500-2000g) babies who weigh (2001-2500g) increased from 4,2% in 2013 to 4,5% in 2014(MOH, 2014_C).

1.6.2 Palestinian Health Care system

Health care system in Palestine is a complex one, because the health service delivery in Palestine is divided into five major health care providers: two public health providers (the Ministry of Health and the Ministry of Interior – Military health services**)** , multiple private providers (hospitals, clinics) and numerous NGOs providers (the United Nations Relief and Works Agency-UNRWA and other local NGOs). The main provider MOH is operating 13 hospitals and 54 clinics in GG (PCBS, 2014; MOH, 2014_B). The main roles and responsibilities of the MOH according to the Palestinian Public Health Law are: providing, regulating and supervising the provision of health care in Palestine. In addition, MOH is responsible for planning the health care services in coordination with different stakeholders, enhancing health promotion to improve the health status, developing human resources in health sector, managing and disseminating health information, and others (MOH, 2014_B).

1.6.3 Governmental Hospital Services

MOH is the main provider of secondary care in the GS. It is responsible for 13 hospitals across the five governorates, the number of MOH hospital beds in the GS is about 1,680, and generally the total number of NICU beds is about 132; 107 beds for the MOH, 19 beds for NGOs, 6 beds for Military Health service. The average occupancy rate at hospitals in the GG is about 86.7%. The unstable Palestinian political situation increases the load on the health care services in Gaza and West Bank (MOH, 2014_B).

1.6.3.1 Neonatal intensive care units:

Neonatal intensive care units are classified into two categories;

1.6.3.1.1 The first category includesthe hospitals that have obstetrics gynecology department such as Al-Shifa Hospital and AL-TahreerHospital.

First, Al-Shifa Hospital is the biggest hospital in Palestine; it is located in the west part of Gaza city. It was established in 1946; its NICU has been established in 1986.It contains 27 incubators (Saleh et al, 2014). The total number of doctors in the neonatal units in Al-Shifa Hospital is 18 doctors:two of them are consultant, only one of them is a neonatologist, and 16 of them are non-consultant doctors. In addition to the total number of nurses which forms 40 nurses, 14 nurses work at the morning shift while 7 of them work at evening shift, and 7 work at the night shift. There is a delivery unit in the same hospitals which treat its own cases and receive transferred cases from other units (GNN, 2015).

Second, AL-TahreerHospital is located in khanyounis governorate.Its NICU has been established in 1989 and started with 8 incubators but now it has 14 incubators (Saleh et al, 2014). According the Gaza Neonatal Network total number of doctors in the neonatal units in AL-TahreerHospital is 8 doctors, none of them isa neonatologist, and 6 of them are non-consultant doctors, in addition to the total number of nurses which forms 17 nurses. There

is a delivery unit in the same hospitals which treat its own cases and receive transferred cases from other units (GNN, 2015).

1.6.3.1.2 The second category includes the hospitals that receive people who seek medical help such as Al-Naser pediatric Hospital and European Gaza Hospital.

The first one is Al-Naser pediatric Hospital which is located in the western part of Gaza city and provides several medical services for children. The hospital includes many departments, a nursery department which has been established in 1973 and started with 7 incubators. In 2011 the NICU department was rehabilitated and renewed by UNICEF fund. Now the department becomes fully equipped and contains 33 incubators (Saleh et al, 2014). The total number of doctors in the neonatal units in Al-Naser hospital is 12 doctors, one of them is a consultant doctor, and 11 of them are non-consultant doctors. In addition to 44 nurses, 10 of them work in the morning shift, 8 of them work at the evening shift, and 8 of them work at the night shift. Even there are no delivery units in the same hospital, the hospital receives transferred cases from other unites.(Gaza Neonatal Network "GNN", 2015). The European Gaza hospital is situated in the southern of GS and was established in 1993. The NICU has been established at 2001 started with 20 incubators (Saleh et al, 2014). The total number of doctors in the neonatal units in European Gaza hospital is 7 doctors, none of them is a neonatologist-consultant doctor and 6 of them are non-consultant doctors. In addition to the total number of nurses which forms 17 nurse, 5 of them work in the morning shift, 3 of them works in the evening shift, 3 of them work in the night shift. Even there are no delivery units in the same hospital; the hospital receives transferred cases from other units. (GNN, 2015).

1.6.3.2 Levels of neonatal nurseries/unit

The GNN classifies the clinical services role delineations for neonatology between levels 1 to 3. Traditionally neonatal nurseries have been classified as either level 1, 2 or 3. Level 1

refers to routine care of babies in postnatal wards and in the NNU. Level 2 nurseries are located in secondary units i.e. hospitals and are providing in addition to level one care a low and high dependency care. Level 3, otherwise known as a Neonatal Intensive Care Unit (NICU) is located in a tertiary centers and provide intensive care in addition to other levels of care (GNN, 2015).

1.6.3.2 .1 Level 3: Intensive neonatal care

Level 3A:

Care of infants of all gestational ages and weights; Mechanical ventilation support, and possibly inhaled nitric oxide, for as long as required immediate access to the full range of subspecialty consultants (GNN, 2015).

Level 3B:

Comprehensive on-site access to subspecialty consultants; Performance and interpretation of advanced imaging tests, including computed tomography, magnetic resonance imaging and cardiac echocardiography on an urgent basis Performance of major surgery on site but not extracorporeal membrane oxygenation, hemofiltration and hemodialysis, or surgical repair of serious congenital cardiac malformations that require cardiopulmonary bypass (GNN, 2015).

Level 3C:

Extracorporeal membrane oxygenation, hemofiltration and hemodialysis, or surgical repair of serious congenital cardiac malformations that require a cardiopulmonary bypass (GNN, 2015).

1.7 Operational definition

This part will includes the definition of terms included in this study

Ventilator Association Pneumonia (VAP)

A pneumonia where the patient is on mechanical ventilation for >2 calendar days on the date of event, with day of ventilator placement being day 1, and the ventilator was in place on the date of event or the day before (CDC, 2016).

Mechanical ventilation

Mechanical ventilation is an invasive life-support procedure with many effects on the cardiopulmonary system? In addition to equipment, requirements for this service include a constant supply of heated humidified oxygen, compressed air, immediate blood gas analysis, chest x-ray accessibility, and 24 hrs. Availability of staff capable of intubation and pneumothorax decompression. The presence of a ventilator alone, without proper support, is not sufficient for quality care (MOH, 2010).

Pneumonia

Neonatal pneumonia occurs perinatal or postnatal in about 1% of full term neonates and 10% of preterm neonates. This prevalence may be as high as 28% for ventilated VLBW infants in the NICUs (MOH, 2010). pneumonia that can be considered are clinical signs and symptoms (e.g., cough, retractions, wheezing and other signs of respiratory distress, respiratory rate, fever, cyanosis, auscultatory findings), results of diagnostic imaging (e.g. chest radiograph, computed tomographic scan), and laboratory tests (microbiological testing for specific pathogens through serology or samples from the respiratory tract, inflammation markers such as white blood cell count, and differential or acute inflammatory markers such as C-reactive protein) (Langley, et al 2005).

Aged < 5 years, with pneumonia who present with cough or difficulty breathing and have either severe pneumonia (lower chest wall indrawing) or very severe pneumonia (central cyanosis, difficulty, breastfeeding/drinking, vomiting everything, convulsions, lethargy, unconsciousness, or head nodding) (Scott et al, 2012).

Chapter (2) literature review

2. Literature review

In this chapter the researcher reviews the critical points of the study variables that are related to developing VAP among neonates. In addition, the researcher reviews relevant previous studies and experiences of other researchers in this field. Neonatal VAP is the core of this study. According to the previous studies, there are several determinants' that may affect VAP: first, intubation profile which is classified into re-intubation and length period of intubation and both have a positive relationship with occurrence of VAP. Second, the neonatal profile which is divided into gestational age (preterm, full-term and post-term babies) in which the preterm babies have a positive relationship with the occurrence of VAP, and the birth weight (over weight, normal birth weight and LBW) in which the low birth weight has a positive relationship with the incidence of VAP. Third, the sensitivity of BAL is divided into negative and positive results, the neonates with the later results have a chance to be infected with VAP. Finally, invasive devises profile which includes chest tube, umbilical line, blood transfusion products and Ryle feeding that all increase the incidence of VAP if the Aseptic procedures are used.

2.1 Conceptual framework

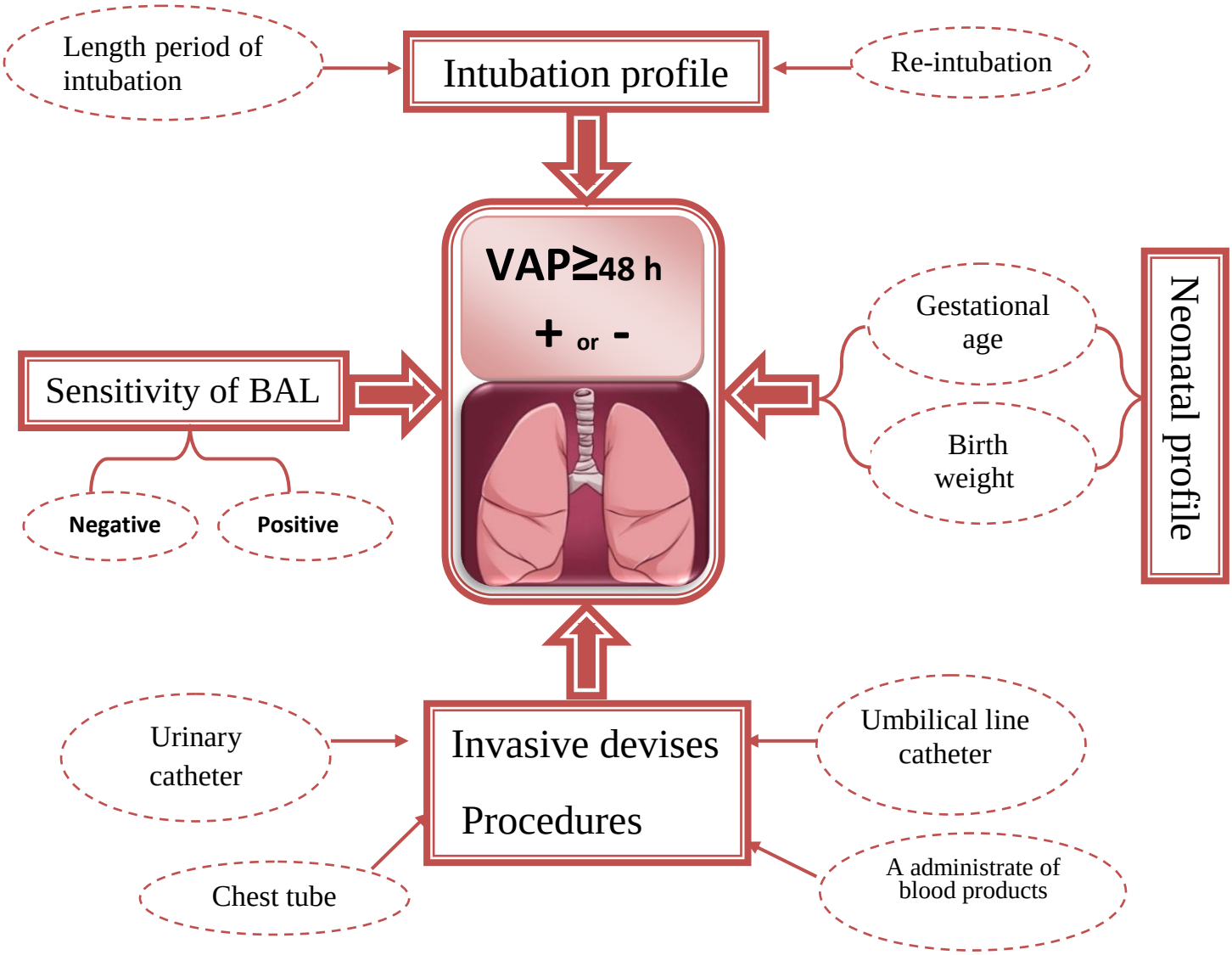

Figure 2.1: Conceptual framework diagram "self-developed"

The researcher has developed the conceptual framework to address the major concepts and variables included in this study after reviewing the available literatures about the neonatal VAP. Also the researcher classified the common determinants.

2.1.1 Neonatal profile

This determines include gestational age such as prematurity and post-term infant. Being a baby of or low birth weight or being delivered with congenital malformations, meconium aspiration pneumonia, congenital pneumonia and respiratory distress syndrome could be factors for development of VAP. Intubated neonates who developed VAP were compared with those who did not develop VAP with respect to post natal age, birth weight, prematurity (gestational ages < 37 weeks), and small for gestational age (SGA). Very low birth weight, and prematurity were significantly associated with VAP as observed by bivariate analysis (Tripathi et al, 2010).

Not to mention the mortality rate increased in infants with a birth weight less than 1,500 g. Among infants who died, those with VAP had longer duration on a ventilator (13.1 vs. 4.0 days; $p<0.001$) (Petdachai, 2004).

Furthermore, the intubated neonates who developed VAP were compared with those who did not develop VAP with respect to post natal age, birth weight, prematurity (gestational ages < 37 weeks), primary diagnosis of neonate and small for gestational age (SGA). Very low birth weight, prematurity, were significantly associated with VAP as observed by bivariate analysis (Tripathi et al, 2010).

2.1.2 Intubation profile

Several factors may contribute to VAP in neonate. These factors include duration on MV stay days of neonates, re-intubation and how many to change times of ETT tube to the neonates (Badr et al, 2011).

Prolonged duration of admission NICU was significant risk factor for VAP. In addition to prolonged duration of ventilation generally increases the risk of infection due to exposure to other devices such as nebulizers, humidifiers, and ventilator circuits, which have been proven to be important sources and media for microorganisms (Khattab et al, 2014).

Intubated neonates who developed VAP were compared with those who did not develop VAP with duration of mechanical ventilation, number of re-intubations, length of NICU stay, primary diagnosis of neonate duration of MV, number of re-intubations and length of NICU stay were significantly associated with VAP as observed by bivariate analysis (Tripathi et al, 2010).

2.1.3 Invasive devices profile

It includes conditions and events occurred during the insertion of chest tube, total parenteral nutrition, umbilical vein catheterization (UVC) and insertion Ryle tube are considered important sources of blood stream infection in ventilated neonates (Bader et al, 2011).

In other study that appears risk factors for VAP. Univariate analysis indicated that the following were significantly associated with VAP: impaired consciousness, tracheostomy, re-intubation, emergency intubation, and nasogastric tube. Selected risk factors were entered into a logistic regression model to perform the multivariate analysis, which revealed that the independent risk factor for VAP were emergency intubation and tracheostomy (Joseph et al, 2009).

Overall devices association infection (DAI) incidence was 8.16/100 device-used patients and incidence density was 9.29/1000 device days. VAP incidence was 6.6/100 ventilated patients and VAP rate was 13.76/1000 ventilator days. (CVC)/(UC) blood stream infection (BSI) incidence and rate were 1.5/1000 catheterized patients and 3.8/1000 CVC/UC days, respectively. During their NICU stay, 9 infants had multiple DAIs and 31 infants had a single episode of DAI (Yalaz et al 2012).

2.1.4 BAL culture and sensitivity profile

Several studies highlight the association of positive secretions culture from Bronchoalveolar lavage with VAP among neonates. Many of literature shows that the most common causative organisms were pseudomonas aeruginosa, klebsilla, Escherichia coli, staphylococcus aureus, acinetobacter, candida and protes (Fathy et al, 2013).

The results of non-bronchoscopicbronchoalveolar lavage culturesrevealed the presence of *Klebsiella*spp. (34%), *Pseudomonas* spp. (25.5%), *S. aureus*(17%),*E. coli* (17%), and *Candida* spp. (6.4%). *K. pneumoniae*was the most commonly isolated pathogen in non-bronchoscopicbronchoalveolar lavage (Khattab et al, 2014).

In addition, the NB-BAL is well tolerated and clinically useful in mechanically ventilated newborns. This prospective study shows that NB-BAL is effective in collecting distal respiratory tract secretions, with a minor degree of contamination. These results suggest that NB-BAL fluid microscopic examination and cultures can offer a sensitive and specific means to diagnose VAP in newborns and may provider relevant information about the causative pathogens. In VAP, NB-BAL was contributive to decision-making concerning antimicrobial therapy (Köksal et al, 2006).

Moreover, 73 VAP events were documented throughout the study, 90.4 % (66/73) of them revealed positive isolates on culturing their NB-BAL (37/42, 88 % in phase-I &29/31, 93.5 % in phase-II). Gram negative bacteria were the most commonly isolated micro-organisms (97.2 % versus 93.1 % in phase-I and II respectively), klebsiellapneumoniae was the leading causative pathogen throughout the study period. No single case of Gram-positive isolates was diagnosed in phase-I cases, compared to 6.9 % (2 cases) among those in phase-II. Fungus, namely Candida spp. was the single isolate from one case in phase-I, but were isolated mixed (Azab et al 2015). Non-bronchoscopicbronchoalveolar lavage (NB-BAL) has been shown to be the most reliable sampling method for diagnosing VAP

reported the sensitivity, specificity, and positive and negative predictive values of NB-BAL fluid culture for VAP diagnosis in 145 newborns as 90%, 90%, 70%, and 97%, respectively (Morrow et al, 2013).

2.2 Epidemiological background

In Lebanon the VAP incidence was 47%, in Jordan it was 25.2% and in Egypt it was 55,3%, in newborn (Khttab et al, 2014). National Nosocomial Infection Surveillance (NNIS) program has published an important data about VAP, saying that VAP is second most frequent cause of nosocomial infection (20%) in pediatric intensive care unit, with ratesVAPin oscillate from 1,4 to7 episodes per 1000 ventilator days. In developing countries the range is significantly higher, it rates from 16,1 to 89 episodes per 1000 ventilator days. Shedding light on neonatal population, the incidence is influence by the gestational age and regional economic development. The developed countries have the incidence which ranges between 2,7 to 10,9 episodes per 1000 ventilator days on the other hand this incidence in the developing countries may reach up to 57,2 cases per 1000 ventilator days the previous difference between the ranges can be illustrated by using different criteria to define VAP (Cernada et al, 2014).

According to the data reported in healthcare associated infection (HAIs) VAP is common in NICU and proportions between 6,8% and 57%. The range of VAP incidence in an Iranian and Turkish NICU were (3,8/ 1000) and (11,6/1000) ventilator days, respectively. A higher incidence was reported in anther Iranian stay 42% of 38% neonates on mechanical ventilation. According to a lot of studies from USA, Italy and Iran the VAP prolonged mechanical ventilation by almost 8-12 days. Increasing the length of stay was the main cause of reaching the attributable coasts up 1040 US$ in Iran and 51,157 US$ in the USA (Aelami et al, 2014).

2.3 Definition of VAP

VAP in the neonate is a condition characterized by one or more of the following signs; Worsening of gas exchange [e.g. oxygen desaturations (e.g. pulse oximetry<94%), increased oxygen requirements, or increased ventilation demand] (Cernada et al, 2014). At least four of the following signs as considered as symptoms to diagnose VAP:1- fever (>38 c˚), hypothermia (<36,5c˚), or temperature instability 2- new onset or increasing bradycardia (<80/min) or tachycardia (>200/min) 3- new onset or increasing tachypnea (> 60/min) or apnea (> 20 seconds) 4- new onset or increasing signs of dyspnoea (retraction, nasal flaring, grunting) 5- increasing production of respiratory secretion and need for suctioning 6- purulent tracheal secretion 7- isolation of a pathogen in respiratory secretions 8- elevated c-reactive protein (>20 mg/l) (Aelami et al, 2014).

2.4 VAP diagnosis problem

Reviewing literaturesshows that thereare no golden standards to diagnose VAP, especially among neonates. Some studies diagnosed VAP by depending on radiological criteria only (chest infiltration), other studies diagnosed it by depending on microbiological criteria only (BAL positive culture), another criteria used to diagnosed VAP was clinical criteria only (at least 3 from 7 pointes found), these clinical signs are leukocytosis or leukopenia, hyperthermia or hypothermia, tachypnea or dyspnea, tachycardia or bradycardia, abnormal of PH stability, apnea and increasing production of respiratory secretion.In some other studied.The researches mixed between clinical and radiological criterion or between radiological and microbiological criterion. In this study, the researcher depends on positive diagnoseson chest x-ray, chest infiltration and positive culture of BAL. In the clinical criteria positive clinical finding should be at least 3 from 7 clinical signs, these clinical signs are: leukocytosis or leukopenia, hyperthermia or hypothermia, tachypnea or dyspnea,

tachycardia or bradycardia, abnormal of PH stability, apnea and increasing production of respiratory secretion.

2.5Classification of neonatal VAP

2.5.1 Early onset VAP

It is defined as pneumonia that occurs within 4 days after 48 hours and this is usually attributed to antibiotic sensitive pathogens whereas (Kalanuria et al, 2014).

2.5.2 Late onset VAP

Late onset VAP is more likely caused by multidrug resistant (MDR) bacteria and emerges after 4 days of intubation (Kalanuria et al, 2014).

2.6 Clinical signs of VAP

Neonates are examined after birth to check for any abnormalities and to make sure the transition to extra uterine life. In addition, they should go througha complete physical examination within 24 hours of birth. The most common signs an associated with neonatal VAP includes:

2.6.1 Bradycardia

In the healthy preterm, the average heart rate ranges from 120 to 170 beats/min less than is considered bradycardia and in the other hand in the healthy infant between (0-3 months), the average heart rate ranges from 100 to 150 beats/min less than is considered bradycardia (Kliegman et al, 2015).

2.6.2 Tachycardia

In the healthy preterm, the average heart rate ranges from 120 to 170 beats/min and more than 170 beats is considered tachycardia in preterm and in the other hand in the healthy

infant between (0-3 months), the average heart rate ranges from 100 to 150 beats/min and more than 150 beats is considered tachycardia in neonates full term (Kliegman et al, 2015).

2.6.3 Temperature

The normal range of body temperatures for neonate 36.5c˚ to 37.5c˚ but hypothermia for neonates is divided to three categories as: Hypothermia in whichthe range of body temperature less than < 36.5c˚, Sever hypothermia in which the range of body temperature less than < 32.0c˚ and finally Hyperthermia the normal range of body temperatures for neonate 36.5c˚ to 37.5c˚ but hyperthermia for neonates is more than or exceeds to > 37.5c˚ (Short et al, 2015).

2.6.4 Tachypnea

The normal range of respiratory rate for neonate preterm 40-70 breath/min and infant (0-3months) 35-55 breath/min. Tachypnea alone means an increased respiratory rate 70 breath/min to preterm and increased respiratory rate 55 breath/min to full term (Kliegman et al, 2015).

2.6.5 Apnea

Apnea is defined as the cessation of pulmonary airflow for a specific time interval, usually longer than 10 to 20 seconds. Bradycardia often accompanies prolonged apnea (Marcdante et al, 2011).

2.7 Indication for neonate to be connected to MV:

2.7.1 Congenital Anomalies

Are also known as birth defects, congenital disorders or congenital malformations. Congenital anomalies can be defined as structural or functional anomalies (e.g. metabolic

disorders) that occur during intrauterine life and can be identified prenatally, at birth or later in life (WHO, 2015).

2.7.2 Meconium aspiration syndrome

Meconium aspiration syndrome (MAS) is among the most common causes of hypoxemic respiratory failure in term newborns who require intensive care. Recent studies estimate that the incidence of MAS in babies greater than 37 weeks' gestation ranges from 0.4% to 1.8%. Among babies born after 39 weeks' gestation with lung disease requiring mechanical ventilation, more than half suffer from MAS (Gleason et al, 2012).

Meconium aspiration syndrome (MAS) or other aspiration syndromes (blood or amniotic fluid) rarely present in the LBW newborn. These diagnoses are characteristically seen in the full term or post-date newborn. Meconuim stained amniotic fluid in the LBW premature infant should arise serious suspicion for neonatal infection, particularly neonatal listeria, newborns with MAS develop substantial respiratory disease with cyanosis, hypotension, acidosis, and coarse ronchi on physical examination. Persistent pulmonary hypertension of the newborn (PPHN) as a secondary diagnosis to MAS or other aspiration syndromes should be suspected in all near-term newborns with significant distress and passage of meconium. The chest X- ray of MAS classically demonstrates hyper infiltration, air trapping, patchy infiltrates, and possibility of air leaks (Guha et al, 2005).

2.7.3 Birth asphyxia

The definition of birth asphyxia is the failure to establish breathing at birth which results in approximately 900,000 deaths per year, where it's considered as one of the major causes of early neonate mortality. WHO and the American Academy of Pediatric have recommended guidelines for neonatal resuscitation contain a set of typical practice that enhances the outcomes in asphyxiated neonates. This set of slandered practice sheds the light on the

importance of drying, stimulating, warming, newborns in distress, in addition to its role in suctioning the airways. In the case of appearing some clinical signs such as apnea or bradycardia on the face of a baby, the ventilation with the use of bag and mask or equivalent device should be applied. This step was considered as a critical to manage asphyxiated newborns. By the timely application of these techniques a lot of babies have acquired a noticeable capability to resist hypoxia and have improved quickly. On the other hand few newborns have required chest compression or medication administration (WHO, 2008).

In spite of that there is no doubt that, both in industrialized and low income countries a large number of newborn infants are in need of resuscitation at birth. Therefore and because a vast number of deliveries throughout the world still occur at home without authorized health personnel present, it is also important to develop simple resuscitation routines mask. However, only a few newborn infants need advanced resuscitation. In 1:100 to 1:700 endotracheal intubation is needed, 1:1000 needs chest compression, 6:10,000 need epinephrine (adrenaline) and as few as 1:12,000 of near-term and term infants need volume therapy [6‑8]. For preterm infants these numbers are higher (Buonocore et al, 2012).

2.7.4 Respiratory distress syndrome

Respiratory distress syndrome (RDS) [also called hyaline membrane disease (HMD)] is a respiratory disease that primarily affects preterm infants; its incidence is inversely related to gestational age and birth weight. It occurs in about 15-30% of those between 32-36 weeks' gestation, in about 5% beyond 37 weeks' gestation (MOH, 2010).

Respiratory difficulties are encountered in 5 to 7 percent of newborn babies, while pulmonary pathology is the most frequent autopsy finding in the neonates. The clinical diagnosis of respiratory distress is suspected when the respiratory rate is more than 60 per

minute in a quiet resting baby, and there are either inspiratory costal recessions or expiratory grunt. During first 72 hours, infant with RDS have increasing distress and hypoxemia. In infants with sever RDS; the development of edema, apnea, and respiratory failure necessitates assisted ventilation (Parthasarathy et al, 2009).

2.7.5 Sepsis

There are two distinct times in the newborn period when sepsis is more likely. These are described as early onset and late onset infection:

2.7.5.1 Early onset infection

Ii is defined as symptoms that appear at birth or within the first 48 hours following birth. This may have occurred in utero due to organisms from the mother so that the baby is born with a congenital infection that may be severe if not immediately treated. Most cases of early onset infection are caused by group B streptococcus (GBS) and infants present with symptoms either immediately or within the first few hours (Edwards et al 2010).

The signs of early-onset infection may be subtle, with tachypnea suggesting "wet lung disease" or may be more overt with grunting, flaring, and subcostal and intercostal retractions. Because the signs of sepsis can be relatively nonspecific, such as poor feeding and increased sleepiness, they can be overlooked. In newborn or intermediate or intensive care nurseries, one must be attuned to subtle abnormal findings in newborn infants. The clinical signs of neonatal sepsis include hyperthermia or hypothermia, respiratory distress, apnea, cyanosis, jaundice, hepatomegaly, abdominal distention, feeding abnormalities, and neurologic abnormalities. Autopsy findings in preterm infants with fatal early-onset GBS infection suggested that surfactant deficiency respiratory distress syndrome was common (Gleason et al, 2012).

2.7.5.2 Late onset infection

Is define as those infections that arise after the initial 48-hour period. Again, it is possible that these organisms originated from the mother but it is more likely that they came from the environment. The most commonly responsible organism is coagulase negative staphylococci (CONS) (Edwards et al 2010).

The signs presenting features of late-onset sepsis include increased apnea, feeding intolerance, abdominal distention, guaiac-positive stools, increased respiratory support, and lethargy and hypotonia Because these symptoms are nonspecific, ELBW infants are frequently evaluated for infection and treated with empiric antibiotic therapy (Gleason et al 2012).

Late-onset sepsis (LOS) affects 25 to 50% of ELBW infants and the mortality rate varies from 20 to 80%, depending on the causal pathogen. The main risk factors for LOS are the use of central lines, mechanical ventilation and parenteral nutrition. The clinical diagnosis of LOS is made more difficult in ELBW infants because of nonspecific clinical features anda lack of sensitive diagnostic tests (Buonocore et al 2012).

2.7.6 Premature babies

The major reason for ventilating an infant is apnea. However, the difficult decision comes with deciding when to ventilate an infant, who is very premature, or breathing with retraction of the lower chest wall, or requiring oxygen treatment, or having numerous apneic episodes. Intubation and ventilation of very premature babies with respiratory difficulty soon after birth used to be considered mandatory. However, it is now realized that even very premature babies can often be supported with CPAP alone particularly if treated early with caffeine (Buonocore et al, 2012). Premature newborns with birth weights of 500‑1250 grams who required ventilator support between 7 and 21 days of age. Infants

were treated with study gas for a minimum of 24 days, and had an estimated OI of 7 (Buonocore et al, 2012). Weights of 500‑1250 grams and requiring mechanical ventilation in the first 48 hours of life were randomized to treatment with 5 ppm iNO or placebo gas and treated for 21 days or until extubated (Buonocore et al, 2012).

2.8 Procedures and investigation that used to detect VAP:

2.8.1 Pulse oximetry

Noninvasive test in which using a small sensor is attach to a fingertip or toe, the sensor used to estimate of oxygen saturation (SaO_2) in blood (National Heart Lung and Blood Institute, 2011). SaO_2 below 88 % would indicate hypoxia. While SaO_2 between 88 – 94 % would be normal in the more premature neonates, higher SaO_2 values are normal in full term neonates. Increasing requirement of inspired oxygen, to maintain normal SaO2 would therefore be a threatening sign (Diwakar, 2003).

It detects the O_2 saturation of hemoglobin by measuring the blood absorption of two or more wavelengths of light. It is noninvasive, easy to use, and reliable. Because of the shape of the ox hemoglobin dissociation curve, O_2saturation does not decrease much until the po_2 reaches approximately 60 mm Hg. Pulse oximetry may not accurately reflect true O_2 saturation when abnormal hemoglobin is present (carboxyhemoglobin, methemoglobin), when perfusion is poor, or if no light passes through to the photo detector (nail polish) (Marcdante et al, 2011).

2.8.2 Chest X-ray

Theyare useful in assessing respiratory disease in children. In addition to determining lung abnormalities, they provide information about the bony thorax (rib or vertebral abnormalities), the heart (cardioaortic arch/vascular rings, rib notching). Chest radiographs should be obtained in both the posteroanterior (PA) and lateral projections. Estimation of

lung hyperinflation based on a single PA view is unreliable, whereas flattened diaphragms and an increased AP diameter on a lateral projection indicates hyperinflation. Expiratory views and fluoroscopy may detect partial bronchial obstruction due to an aspirated foreign body resulting in regional hyperinflation because the lobe does not deflate on exhalation. Routine chest radiographs should be obtained after a full inspiration (Marcdante et al, 2011). In this study, the researcher based on positive radiological diagnoses; chest x-ray to detect the existence of chest infiltration.

2.8.3 Arterial blood gas test (ABG)

Blood gas analysis provides information about the effectiveness of both oxygenation and ventilation. However, arterial samples are more difficult to obtain, so capillary and venous blood samples are more commonly used. The PCO2 from a capillary sample is similar to that from arterial blood. The PCO_2 in venous samples is approximately 6 mm Hg higher than arterial PCO_2. The ratio of the serum bicarbonate concentration to PCO_2 determines the PH. Capillary or venous samples should not be used to assess oxygenation (Marcdante et al, 2011). Arterial blood gas allows measurement of CO_2 levels and analysis of the severity of oxygenation defect through calculation of an alveolar-arterial oxygen difference. A normal PCO_2 in a patient who hyperventilation should heighten concern about the risk of further deterioration (Marcdanteet al, 2011).

2.8.4 Minibronchoalveolar lavage

Minibronchoalveolar lavage (mini-BAL) is a nonbronchoscopic bedside method of performing a small-volume BAL for quantitative culture results to guide antibiotic therapy prescribed for patients suspected of VAP. These catheters are smaller in diameter than abronchoscope, so the risk of complications is minimized. The procedure typically only requires the sampling catheter to be in the airway for 1 to 2 minutes. Moreover, lavage

volumes are significantly smaller than those used in bronchoscopy, so there is less residual fluid in the lung, resulting in faster post procedure patient recovery time (Hess et al, 2016).

BAL and min-BAL are considered to be invasive despite their blind performance. They require the insertion of a catheter and available amount of fluid into the lung (Torres et al, 2006).

Chapter (3) Methodology

3. Methodology

This chapter presents the methodology of the study implemented to answer the research questions. Different items were explained: study design, place of the study, study population, sample size, sampling process, period of the study, inclusion and exclusion criteria, validity, ethical and administrative consideration, study tools, pilot study, data collection, data management, and limitation of the study.

3.1 Study design

The design of this study is descriptive, analytical, cross sectional study as it assesses incidence and determinants of VAP of neonates at Governmental hospitals in GG. Cross-sectional study is appropriate for describing the status of phenomena or for describing relationships among phenomena at a fixed point in time (Polit& Beck, 2004).

3.2 Setting of study

This study was carried out at GG, mainly at NICU in AL- Shifa Hospital from Gaza governorate, AL-Tahreer Hospital from the Khan Younis Governorate, Al-Naser pediatric Hospital from GG and finally European Gaza Hospital from both Rafah and Khan Younis governorates.

3.3 Study population

The target population of the survey consist all the neonates who are admitted to NICU department and connected to the MV for more than 48h, they are approximately estimated 102 baby.

3.4 Sampling process and sample size

After reviewing the annual reports of MOH, there were no reports show the exact number of the babies who are connected to MV in NICU. So the researcher followed the ventilated babies more than 48 hours in the four hospitals. Accordingly, there were 13 babies in AL-Shifa Hospital during 2 Weeks, three babies in Al-Naser pediatric hospital also during two weeks, only one baby in AL-Tahreer Hospital and four babies in European Gaza hospital.

The study survey consisted of 102 newborn babies. The number of cases admitted during this period were 102 babies admitted to neonatal intensive care unit at Al-Naser pediatric Hospital, AL- ShifaHospital, AL-Tahreer Hospital and finally European Gaza Hospital during 100 days (period of data collection) and diagnosed with VAP.

3.5 Period of the study

The study wasinitiated immediately after the approval of the proposal. A pilot study was conducted in the first ten days of May 2016. Data collection started in thefirstof May 2016 and continued to the tenth of August 2016, approximately 100 days. Data entry, analysis and writing the final report continued till the middle of March 2017.

3.6 Eligibility criteria

Sample of this study was chosen according to the following criteria.

3.6.1 Inclusion criteria for cases

- Age less than 28 days.
- Admitting to the NICU at Governmental Hospital.
- Being diagnosed as VAP confirmed by physician.
- One Chest x ray infiltration.

- Neonates infected by VAP because they have been connected to mechanical ventilator for more than 48 hours.

3.6.2 Exclusion Criteria:

- Babies older than 28 days.
- Neonates diagnosed by pneumonia before 48 hours from connecting to mechanical ventilator.
- Neonates who diagnosed with congenital pneumonia.

3.7 Tools of the study

Data were collected by the researcher using constructed direct observation checklist sheet (annex 8) to observe the neonates directly in NICU on mechanical ventilators and to record the clinical manifestation, microbiological results, radiological chest x-rays, the measurement of birth weight, gestational age, length of intubation period, Re-intubation, and invasive devises such as umbilical line, chest tube, transfusion of blood and blood products and Ryle tube in the checklist sheet. In addition, the researcher will ask the physician about the infiltration of chest x-ray as well as he recorded the vital signs of the neonate from his medical record file.

3.7.1 Observational checklist sheet

The first direct observation checklist sheet constructed and structured by the researcher after reading the related literature. It includes the following section:

- The first part includes neonatal information about gender, address,hospital name and date of admission.
- The second part includes gestational age, birth weight and type of delivery.
- The third part includes intubation profile about length of intubation and times of ETT changed

- The fourth part includes BAL culture results and the name of causative microorganism.
- The fifth part includes invasive devises profile: umbilical line, Ryle feeding, chest tube, and administration of blood products.
- The sixth part handles the chest x-ray including chest x-rays before and after intubation and examines any chest infiltration on x-rays.
- The seventh part handles the clinical sings of neonates including: heart rate, body temperature, respiratory rate as well as if neonates enter apnea or not.
- The eighth part deal with the medical diagnosis of neonates including: respiratory distress, birth asphyxia, sepsis, premature, congenital anomalies or others diagnosis.
- The ninth part is the laboratory test of CBC, ABG and blood culture result.

Thechecklist sheet was reviewed by seven experts(annex 9). The aim of thisstep is to increase both content and criterion validity.

The second direct observation checklist sheet (annex10), constructed and structured by the researcher after reading the related literature. It includes the following:

- The first part investigates hand washing including hand washing before suction,hand washing after suction, hand washing during several contacts for the same patient and hand washing according WHO.
- The second part includes disinfectant tools of ETT including:ETT disinfectant, M.V disinfectant,laryngoscope disinfectant andAmbo Bag Mask disinfectant.

- The third part includesinfection control procedures for the Suction process including: wearing sterilizedgloves,changing suction connection,using suitable suction gauge, and reusing suction tube and etc.
- The fourth part includes infection control policieswhich containpolicy written by UVC,protected VAP policy, VAP isolating,VAPstatistics and receiving training or lectures.
- The fifth part is about infection control Kitsexamining the availability of liquid soap, sterilization soap，Alcohol，Hand rubbing andthe toilet tissues.

3.8 Validity of the instruments

Validity tries to assess whether a measure of a concept really measures that concept, that is, the extent to which the concept measures the thing it was designed to measure (Singh, 2007).

The researcher appliedtwo types of validity as follow:

1. Face validity: the checklist used for data collection in the study which wasprepared by the researcher to ensure high face validity.

2. Content validity

After reviewing many studied related to the subject, the researcher designed the study checklist for the purpose of the study. The validity of checklist has been examined by sending the constructed checklist with the enclose covering letter about the objectives of the study to seven experts working in the different health field in order to give their points of views on the checklist. The checklist was modified according to their suggestions and advices.Standardization of the procedures of the measurement also will be done as follows:

3.8.1 Standardization of Performing Mini-BAL (Hooser, 2006).

Step By Step Procedure for Performing Mini-BAL

1. Obtain, from patient and staff, information regarding the pneumonia (location, etc.) and any other pertinent patient information (e.g. physical abnormalities).
2. Gather and prepare necessary equipment prior to performing the procedure:
    - BAL catheter
    - Premarked laboratory specimen slip
    - Specimen trap
    - Sterile saline
    - Drape
    - SpO2 monitor
3. Increase the $FIO_2$to 1.00 (i.e., 100% oxygen).
4. Closely monitor patient throughout procedure for evidence of desaturation. If desaturation occurs (SpO_2< 90%), the procedure should be terminated immediately.
5. Wash and dry hands appropriately.
6. Open BAL catheter package in a sterile manner and lay on sterile field.
7. Put on sterile gloves and mask.
8. Connect 30 ml syringe with 1-3 ml sterile saline.
9. Pass catheter through access port elbow extending to 1½ inches. Attach access port elbow between the Endotracheal Tube and ventilator circuit. Once the adapter is secured into the ET tube, extend the BAL catheter to the end of the ET tube. Align the numbers on the ET tube with the numbers on the BAL catheter to show when this has been achieved.
10. Extend the BAL catheter 2-4 cm (depending on the ET tube position and patient size) beyond the end of the ET tube and flush the catheter with 1-3 ml sterile saline.

11. Direct the catheter tip to the chosen lung by orienting the O_2 port to the side of the chosen lung.
12. Advance the catheter until about 1-3 cm of BAL catheter protrudes beyond the access port elbow, and then advance the inner catheter from the outer catheter until resistance is met. The inner catheter should now be in a wedge position.
13. Lock the catheter in place. Note: For patients with untrimmed Endotracheal Tubes, the catheter should protrude no more than 6 cm from the patient's mouth or nose.
14. Attach a 30 ml syringe to the BAL catheter stop-cock and instill 1-3 ml of saline.
15. Aspirate the sample into a specimen trap by reversing stop-cock and setting the wall vacuum regulator to 40-60 mm Hg or pull the sample back into the syringe according to hospital protocol.
16. Repeat until the total volume of BAL fluid has been infused and an adequate
17. Disconnect the specimen trap, unlock the catheter and retract the inner catheter. Then remove the BAL catheter and elbow access adapter from the Endotracheal Tube and ventilator circuit. Reconnect the ventilator tubing to the ET tube.
18. Attach the appropriate patient label and lab slip marked "BAL fluid".
19. Send the specimen to the lab for quantitative analysis.

3.9 Reliability of instrument

Reliability signifies the issue of consistency of measures, that is, the ability of a measurement instrument to measure the same thing each time it is used (Singh, 2007).

The following steps will be done to assure instruments reliability:

- Standardization of the method of data collection was guaranteed.
- Then, the data entry in the same day of data collection would allow possible interventions to check the data quality or to re-fill the checklist when required.

- Re-entry of 5% of the data after finishing data entry will assure correct entry procedure and decrease entry errors.

3.10 Data entry and analysis

The researcher used the Statistical Package of Social Science (SPSS virgin. 20) program for data entry and analysisin addition to Microsoft excel. The steps of analysing the collected data were as the following:

- Reviewing the filled checklist.
- Coding the checklist.
- Recording on categories.
- Defining and coding the variable.
- CleaningData.
- Frequency tables of all variables.
- Cross tabulation of the results.
- 95% CI are the statistical tools of measurement use to check the statistical relationship between the determinants (independent variables) and the occurrence of VAP (dependent variable) and to assess the statistical significant of difference.

To achieve the goal of the study, the researcher used the (SPSS version 20) for analyzing the data.Measurements of central tendency including mean, mode, median, and standard deviation were used to determine the frequency of certain determinates in neonates. Other tests such as chi-square were used to examine the relationship between certain determinate such as re-intubation, length period of intubation and others with the occurrence of VAP among neonates in GG.

3.11 Pilot study

A piloting process was conducted before starting data collection. The piloting process aims to test the clarity and applicability of the tool used, also to estimate the length of time required for data collection as well as to clearly detect any barriers that might hinder the study. Itwas conducted on 16 cases, 3 cases from every hospital were selected by the researcher, the cases chosen from the first ten babies admitted to NICU with VAP.

3.12 Ethical and Administrative consideration

- An official letter of request wasobtained from MOH to conduct the study in the governmental hospital (Annex 4.1 and 4.2).
- An official letter of approval to conduct the study was obtained from the Helsinki committee (Annex 6).

3.13 limitation of the study

- Frequent electricity cuts off affected the ability to accomplish the work in a timely manner.
- Financial constraints, the study was self-funded therefore the researcher faced financial constraints.
- Scarcity of literatures and access to published articles.

Chapter (4) Results and Discussion

In this chapter, the researcher illustrates the main results of the study in a comparative way between positive VAP cases and negative VAP cases that were connected to mechanical ventilated more than 48 hours. Primarily,it demonstrates the descriptive variations between positive cases and negative cases. Moreover, it illustrates the different determinants including intubation profile, neonatal profile, and sensitivity of BAL and invasive devisesthat associated with neonatal VAP. Furthermore, this chapter answers the study questions by using different statistical tests including descriptive statistics such as frequency distribution for study variables, means and percentages, in addition to different inferential statistics that investigate the relationships between variables. M.V neonates in the study was observational checklist to collect clinical signs, radiological changes and microbiological sensitivity related to VAP diagnosis, variables of intubation profile, neonatal profile, sensitivity of BAL and invasive devises.

The findings of this study were explained compared with other global and regional studies in attempt to interpret the results and its implication. The results could help in developing preventive health education and health promotion programs.

4.1 characteristics of ventilated neonate survey in NICU

Characteristics of the study of ventilated neonate are shown in (Table 4.1). It surveys 102 cases of ventilator neonates during 100 days in the four of NICU in Gaza governorates.

The table shows the characteristics of ventilated neonates for more than 48 hours. The study survey consisted of 102 babies, divided into four groups; the first group consisted of 46 babies admitted to neonatal intensive care unit (NICU) at Al-Shifa Hospital in Gaza governorate and neonates were put on mechanical ventilators for more than 48 hour; the second group consisted of 25 cases who also admitted to neonatal intensive care unit

(NICU) at AL-Tahreer Hospital in Khan Younis governorate; the third group consisted of 21 cases at Al-Nasser Pediatric Hospital in Gaza governorate who also admitted to neonatal intensive care unit (NICU) and put on mechanical ventilator for more than 48 hour; the fourth group consisted of 9 cases at European Gaza Hospital in Rafah governorate who also admitted to neonatal intensive care unit (NICU) and put on mechanical ventilator for more than 48 hour. The study showssignificant variations in characteristics of ventilated neonate survey included (gender, address, and hospital name).

Table 4.1 Distribution of neonates according to gender, address and hospital name

Variable		Total		End VAP diagnosis				χ^2	P-Value
				Negative VAP		Positive VAP			
		No.	%	No	%	No	%		
Gender	Male	51	50.0	27	45.8	24	55.8	1.005	0.316
	Female	51	50.0	32	54.2	19	44.2		
Address	Gaza city	40	39.2	25	42.4	15	34.9	4.869	0.301
	North Gaza	17	16.7	10	16.9	7	16.3		
	Middle zone	14	13.7	9	15.3	5	11.6		
	Khanyounis	23	22.5	9	15.3	14	32.6		
	Rafah	8	7.8	6	10.2	2	4.7		
Hospital Name	Al-Shifa Hospital	47	46.1	29	49.2	18	41.9	8.878	0.031
	AL-TahreerHospital	25	24.5	9	15.3	16	37.2		
	Al-Naser Hospital	21	20.6	13	22.0	8	18.6		
	European Gaza Hospital	9	8.8	8	13.6	1	2.3		

Table 4.1 shows that the number of male cases equals the number of female cases. 50.0% for male and 50.0%. 55.8% of male cases where diagnosed with positive VAP and 44.2% female positive cases. The results show that there is no relationship between gender and incidence of VAP [$\chi 2$=1.005, P-value = 0.316]. This study is supported by some studies such as (Badr et al, 2011).There were nosignificant differences regarding gender

orindication of NICU admission. This result disagrees with other study by (Srinivasan et al, 2009). Female gender and postsurgical diagnosis were associated with an increased risk of developing ventilator-associated pneumonia in these patients.

The positive cases in AL- shifa hospital, AL-TahreerHospital, Al-Naser Hospitaland European Gaza Hospitalwere (41.9%, 37.2%, 18.6%, and 2.3) respectively. Most cases were in Al-Shifa Hospitalthen AL-Tahreerhospital(41.9% and 37.2%) respectively.

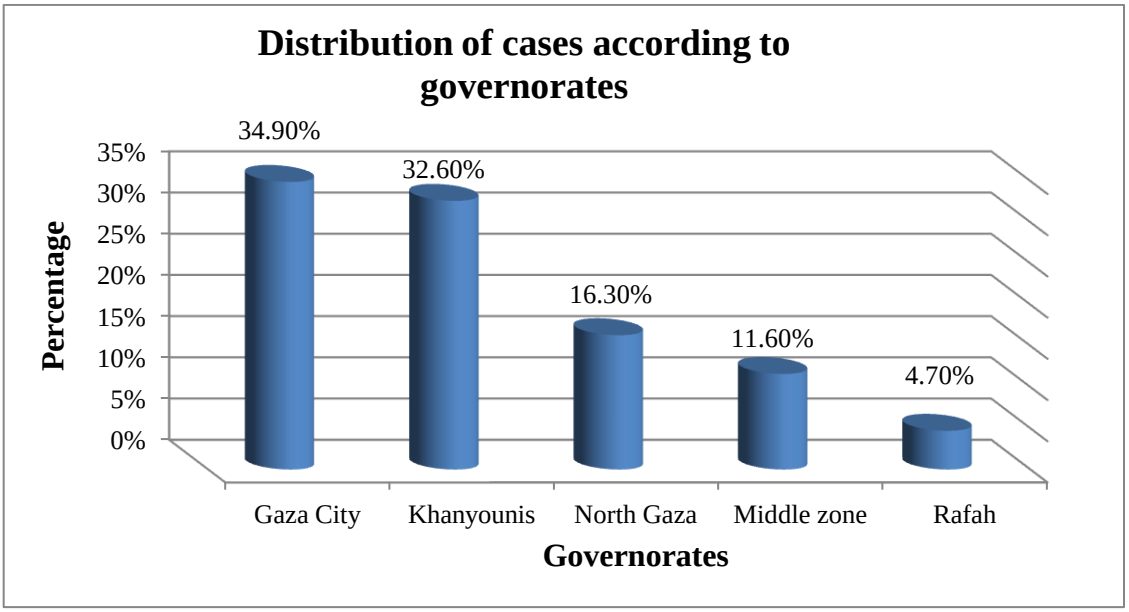

Figure 4.1: Distribution of cases according to governorates

Figures 4.1 shows the survey regarding demographic distribution, the table clarify cases diagnosed VAP by governorates. 34.9% of cases live Gaza City, 32.6% in Khanyounis governorate, 16.3% in North Gaza,11.6% in Middle zone and approximately 4.7% of them live in Rafah.

The researcher thinks that the high precentage in Gaza city is due to the high density of population, as well as the percentage in khanyounis was quiet high because of the same reason.On the other hand, the percentage in Rafah formulates the lowest because of the low density of population.

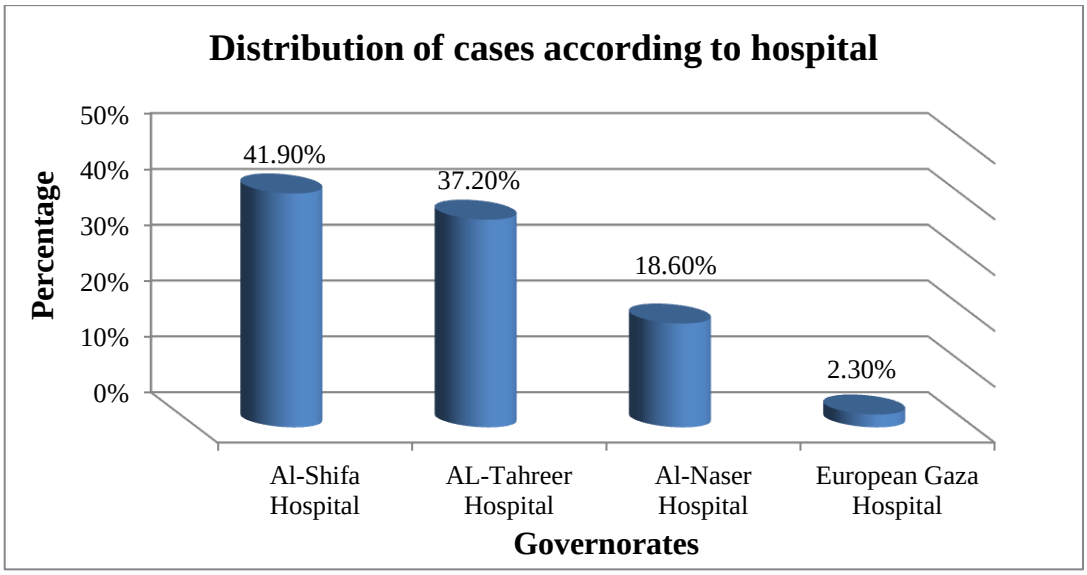

Figure 4.2: Distribution of cases according to hospital

Figures 4.2 shows the survey according to the hospitals that provides MV for neonates in Gaza governorates as the following; 41.9% in Al-Shifa Hospital, 37.2% in Al-TahreerHospital, 18.6% in Al-Naser Hospital, 2.3% in European Gaza Hospital. The test showed strong relationship between hospital perfusion and incidence of VAP [$\chi 2$=8.878, P-value = 0.031]. The researcher illustrates the reasons behind the previous distribution of VAP incidence.

First, in Al-Shifa Hospital the percentage of VAP reached to 41.9% which was the highest percentage because it is the major main hospital of Gaza city and the North of Gaza, it receives very large number of risky cases such as premature babies and deliveries, it also receives neonates from obstetrics and gynecology department and it also suffers from the shortage of medical team although they are well qualified.

Second, in AL-Tahreerhospital, the percentage of VAP reaches to 37, 2% which was a little bit lower than Al-Shifa hospital because it represents the main hospital of Rafah city and KhanYounis city.It also receives neonates from obstetricsand gynecology department; the hospital also suffers from the weakness of infection control supervision.

Third, in Al-Naser Hospital, the percentage of VAP reaches to 18,6 %. The reasons behind this percentage are: the strong infection control supervision, the appropriate number of qualified medical staff and receiving neonates who seek medical help afterbeing discharged from obstetrics and gynecology department.

Fourth, in European Gaza Hospital the percentage of VAP reached to 2,3% because of the qualified medical team and the low number of ventilated babies.

Table 4.2Distribution of neonates according gestational age, and birth weight

Variable		Total		End VAP diagnosis				χ^2	P-Value
				Negative VAP		Positive VAP			
		No.	%	No	%	No	%		
Birth weigh	Very low birth weight	33	32.4	15	25.4	18	41.9	3.330	0.189
	Low birth weight	33	32.4	20	33.9	13	30.2		
	Normal birth weight	36	35.3	24	40.7	12	27.9		
Mean of birth weight 2164.4706		Median 2002.000		Mode 1200.00				SD 893.68196	
Gestational Age	Preterm	64	62.7	35	59.3	29	67.4	1.890	0.389
	Full term	38	37.3	24	40.7	14	32.6		
	post term	3	2.9	1	1.7	2	4.7		
Mean of gestational age 34.47		Median 35.0000		Mode 38.00				SD 3.88	
Ryle tube	Percent			41	69.5	41	95.3	10.551	0.001
	Absent			18	30.5	2	4.7		

Table 4.2 shows the survey concerning birth weight was classified into three categories: very low birth weight"between 1000-1499g", low birth weight "between 1500-2499g weeks",and normal birth weight "between 2500-4000g weeks". The incidence of positive VAP in VLBW weight is 41.9% while the incidence of the low birth weight is 30.2% and the incidence of the normal birth weight is 27.9%. The test shows that there is no relationship between birth weight and incidence of VAP in this study [χ2=3.330, P-value =

0.189].Although the test in this study and P-value is more than 0.05 and not statistically significant, but the researcher found that there is a difference between birth weight and normal birth weight percentages.

This result support the study of (Foglia et al., 2007) whichfocus on estimated gestational age (EGA) rather than birth weight in their 10-month-long case control study of 211 intubated NICU patients. VAP rates were much higher in babies with an EGA of <28 weeks (19 VAP cases) than in babies with an EGA of ≥28 weeks (5 VAP cases) (P < 0.001). The VAP rate per 1,000 ventilator days was also higher in babies with an EGA of <28 weeks (6.5/1,000 ventilator days) than in babies with an EGA of ≥28 weeks (4.0/1,000 ventilator days) but was not statistically significant (P = 0.34). Not all investigators found an inverse relationship between birth weight and frequency of VAP. This result disagrees with other study by (Apisarnthanarak et al., 2003) which VAP occurred at high rates in extremely preterm neonates and was associated with increased mortality. Additional studies are needed to develop interventions methods in order to prevent VAP in NICU patients.

Concerning the gestational age, the survey isclassified into three categories: premature "less than 37 weeks", full terms "between 37- 40 weeks", and post term "more than 41 weeks".The incidence of positiveVAP of the premature is 67.4% while the incidence of the full terms is 32.6% and the incidence of the post term is4.7%. The test shows no connection between governorates and incidence of VAP [$\chi 2$=1.890, P-value = 0.389]. Although the test in this study and P-value is more than 0.05 and is not statistically significant but the researcher found that there is a difference between premature and full terms percentages; the incidence of VAP in the premature is approximately 67.4% while the incidence in the full terms is approximately 34.36% and finally post term is approximately 2.9. The researcher justifies these results due to the survey contents in

which the percentages of premature who are less than 37 weeks were62.7% and the percentage of full term was 36.3%.

For the insertion of Ryle tube and incidence of VAP, the percentage of present insertion Ryle tube shows 95.3% of neonates, whereas when the absence of Ryle tube insertion, the percentage is 4.7% of positive VAP. The test showed strong relationship between present insertion of Ryle feeding and incidence of VAP [χ^2= 10.551, P-value = 0.001]. That means increasing the insertion of Ryle tubecan increase the incidence of the VAP among neonates. This result supported by a study conducted by (Wani et al., 2015) in which he clarifies that the use of nasogastric tube was statistically a significant risk factor associated with VAP. This result disagrees with another study by (Alalem et al., 2015) in which they clarify that there is no significant difference between VAP and non-VAP patients regarding continuous enteral feeding.

Table 4.3Distribution of casesaccording to the duration of intubation&the times of ETT changes

Variables		Type of Participant				χ^2	P-Value
		Negative VAP		Positive VAP			
		No	%	No	%		
Length Period of Intubation	Between (48-72) hours	6	10.2	0	0.0	21.020	0.000
	Between (72_120) hours	25	42.4	4	9.3		
	More than 120 hours	28	47.5%	39	90.7		
Many times of ETT changes	Less than 10 times ETT changes	45	76.3%	23	53.5%	6.847	0.033
	Between (11-20) times ETT changes	9	15.3%	16	37.2%		
	Over than 21 times ETT changes	5	8.5%	4	9.3%		
Mean of times of ETT changes 4.78		Median 3.0000		Mode 3.00		SD 4.58	

Table 4.3 shows the results concerning the duration of intubation which is divided into three categories: the first category "between 48-72 hours", the second category "between 72- 120 hours" and finally the third category "more than 120 hours". The incidence of positive VAP "between 48-72 hours" is 0.0% while the incidence of positive VAP "between 72-120 hours" is 9.3% whereas the incidence of positive VAP "more than 120 hours"is 90.7%. That means the most of positive VAP occurs in the late onset of VAP and this type is considered dangerous because it is multidrug resistance. The test showsa strong relationship between the duration of intubation and the incidence of positive VAP [$\chi 2$= 21.020, P-value = 0.000]. Increasing the length period of intubation to more than 120 hours increases the incidence of VAP. This result was consistent with the results of a study conducted by (Cernada et al, 2014).This shows that VAP increases respiratory morbidity and overall mortality and prolongs the hospital length of stay. VAP is especially associated with prematurity, low birth weight, chronic lung disease, and prolonged MV. Moreover, another published study in (Yuan et al., 2007) shows that neonates of VAP occurs at significant rates among mechanically ventilated NICU patients and is associated with care procedures. The risk factors of neonatal VAP were re-intubation and prolonged duration of mechanical ventilation

Table 4.4Distribution of casesaccording to invasive devices

Variable		Negative VAP		Positive VAP		χ^2	P-Value
		No	%	No	%		
Chest tube	Present	5	8.5	25	58.1	29.551	0.000
	Absent	54	91.5	18	41.9		
Umbilical line vein	Present	12	20.3	39	90.7	49.251	0.000
	Absent	47	79.7	4	9.3		
urinary catheter	Present	5	8.5	22	51.2	23.287	0.000
	Absent	54	91.5	21	48.8		

Table 4.4 shows the results regarding invasive devises management, the table of neonates shows that diagnose positive VAP to percent insertion chest tube that shows 58.1% of neonates while were absent insert chest tube, 41.9% of positive VAP, The test showed strong relationship between percent insert chest tube and incidence of VAP [χ^2= 29.551, P-value = 0.000].The table shows that insertion chest tube is determinates of VAP among neonates.

On the other hand, positive VAP in the presence of insertion ofULVfor neonates shows that the percent is 90.7% while the percent in the absence ofULV is 9.3% of positive VAP, The test showed strong relationship between insertingULV and incidence of VAP [χ2= 49.251, P-value = 0.000]. In this study, the researcher found that insertion ofULV is a determinant of VAP among neonates. This result is supportedbyanother study by (Petdachai, 2004). In the previous study,the result of significant clinical parameters such as ULV was positive [adjusted odds ratio (AOR)=2.5; 95% confidence interval (CI)=1.3 to 4.7; p=0.007].

According to the insertion of the urinarycatheter and incidence of VAP the percentage of present insertion urinarycatheter shows51.2% of neonates, but the percentage with the absence of the insertion of folly catheter is 48.8% of positive VAP. The test showsa relationship between the presence of insertion urinary catheter and positive VAP [χ^2= 23.287, P-value = 0.000]. In this study, the researcher found that insertingurinary catheter isdeterminant of VAP among neonates. Concerning urinary catheter the researcher did not find any previous studies deal with it as a risk factor of VAP. So the researcher tends to examine its affects as determinant of VAP among neonates. According to literature review,urinary catheter is considered part of invasive devises. Many previous studies detected that enteral nutrition are determinants for VAP as they may increase the risk of gastric distention, colonization with gram-negative microorganisms to multiply in the

stomach, and consequently lead to an increased rate of neonatal pneumonia (NP). Though, to reduce the risk of NP, it is important to avoid unnecessary enteral nutrition.

Table 4.5Distribution of cases according toblood administration

Administration blood products		Negative VAP		Positive VAP		χ^2	P-Value
		No	%	No	%		
Administration of blood products	Yes	17	28.8	29	67.4	14.989	0.000
	No	42	71.2	14	32. 6		
If yes administration blood products	Plasma	7	11.9	2	4.7	22.105	0.000
	Packed RBS	4	6.8	5	11.6		
	Plasma & human albumin & Packed RBS	1	1.7	5	11.6		
	Plasma & Packed RBS	6	10.2	17	39.5		
	No administration blood products	41	69.5	14	32.6		

Table 4.5 shows the results according to the blood administration and incidence of VAP.The percentage of yes blood administration is 67.4% of neonates, but the percentage of no blood administration is 32.6% of positive VAP. The test showsstrong relationship between yes blood administration and incidence of VAP [χ^2= 14.989, P-value = 0.000], aswell as to the blood administration component that included **(**plasma, packed RBS,(plasma, human albumin and packed RBS) and (plasma and packed RBS) **)**.

For plasma component transfusion, the percentage reaches approximately 4.7% of positive VAP. For packed RBS component transfusion the percentage is 11.6%.The percentage reaches to 11.6% of positive VAP in (plasma, human albumin and packed RBS). For both (plasma, packed RBS) component transfusion, the percentage is 39.5% of positive VAP. The test clarifies that there is a strong relationship between blood transfusion and incidence of VAP [χ2= 22.105, P-value = 0.000]. That means increasing blood component transfusioncan increase the incidence of the VAP among neonates. Regarding the neonates

on M.V for more than 48 hours who didn't undergo any blood component transfusion, their percentage is approximately 32.6% of positive VAP. In addition,for blood products transfusion to neonates the researcher did not find any previous studies dealing with it as determinates of VAP in neonates. So he tends to examine its affect as a risk factor of VAP among neonates. Due to previous studies, blood products transfusion to neonates is considered part of invasive devises.

Table 4.6Distribution of cases according to blood culture results

Result of blood culture	Negative VAP		Positive VAP		χ^2	P-value
	No.	%	No.	%		
Klebsilla	3	5.1	13	30.2	54.830	0.000
Acinetobacter	12	20.3	21	48.8		
Candida	0	0.0	3	7.0		
Pseudomonas	2	3.4	5	11.6		
Coagulase-negative staphylococci	0	0.0	1	2.3		
Negative blood culture	42	71.2	0	0.0		

Table 4.6 shows the results concerning blood culture sensitivity, the table (4.6) clarifiesthat the percentage of neonates who were diagnosed VAP byacinetobacter is 48.8%, byklebsilla is30.2%, by candidais 7.0%, by Pseudomonas is11.6%, by Coagulase- negative staphylococci reaches approximately 2.3%, and the percentage of neonates negative blood culture and positive VAP of neonates is0.0%. The test clarifies that there is a significant difference between positive VAP and negative VAP regarding the blood culture and the risk of developing VAP, the difference between positive VAP and negative VAP is statistically significant [χ^2= 54.830, P-value = 0.000].That means that positive blood culture increase the incidence of the positive VAP increase among ventilated neonates of more

than 48 hours.This result is consistent with the results of a study conducted by Badr et al. (2011) in which microorganisms associated with blood stream infection in VAP diagnosed group were Klebsiella (15.6%), S. aureus (12.5%), Pseudomonas (9.4%), E. coli (6.2%), Candida (3.1%); 53.1% of obtained blood cultures were sterile. Also this result is inconsistent with a study conducted in Indian showed that blood culture has limited value in microbiological diagnosis of VAP. Endotracheal aspiration (ETA) shows 45% positive culture while blood culture yields only 25.88% positive culture. Blood culture may be useful for finding extra pulmonary source of infection associated with VAP (Santosh, 2016).

Table 4.7Distribution of cases according toneonatal profile

Variable		Negative VAP		Positive VAP		χ^2	P-value
		No	%	No	%		
Mode of delivery	Cesarean section	20	33.9	26	60.5	7.090	0.008
	NSVD	39	66.1	17	39.5		
Birth weight	Normal BWT	23	39.7	12	27.9	1.505	0.220
	Low BWT	35	60.3	31	72.1		

Table 4.7 shows the results concerning mode of delivery the survey is divide into two categories CS and NSVD.The incidence of VAP in the CS was 60.5% while the VAP incidence in the normal spontaneous vaginal delivery was 39.5%. The test clarifies that there is a significant difference between positive VAP and negative VAP regarding the mode of delivery and CSconstitutes a risk for developing VAP.The difference between positive VAP and negative VAP was statistically significant [χ2= 7.090, P-value = 0.008].That means if neonates delivered CSand required to be put on MV more than 48 hours the incidence of the VAP increases. This result is inconsistent with another study

showsthat there were non-significant differences regarding mode of delivery and indication of NICU admission (Badr et al, 2011).

According to birth weight the survey was divided into two categories: normal birth weight (2500g-4000g) and LBW that "less than 2500g".The incidence of VAP in normal birth weight is 27.9% while the incidence of VAP in the LBW reaches approximately to 72.1%. The test shows no relationship between the birth weight and the incidence of VAP [$\chi 2$=1.505, P-value = 0.220]. Is clear that 66 neonates from 102 of total neonates have LBW and only 35 neonates from 102 of total neonates have normal birth weight and that result in abnormal distribution in the sample. There is a difference between percentages but this difference is not significant because of the degree of p-value which reached to less than 0.05. The percentage of positive VAP in LBWis 72.1% as well as the percentage of positive VAP in normal birth weight is 27.9% of ventilated babies more than 48 hours.This result differed with other study by (Foglia et al, 2007).LBW has been shown to be a risk factor for the development of nosocomial pneumonia. A 41-month surveillance study demonstrated a significant association between a birth weight of <1,500 g and a higher rate of nosocomial pneumonia (48). However, LBW may be a marker for an increased duration of mechanical ventilation.

4.2 Direct observation committing to principles of infection control in NICU

The total direct observation checklist (30) that involve four hospitals AL- shifa hospital 12 observations ,Al-Naser Hospital 10 observations ,AL-Tahreer Hospital 5 observations, andEUG 3 observations That was during one month started from the 23rd of June to 23rd of July 2017.

Table 4.8 Direct observation of committing to principles of infection control in NICU

Variable	Hospitals	No	Mean	Std	F	P-value
Hand Washing	**EUG**	3	75.0	25.0	24.807	0.000
	Al-Shifa Hospital	12	14.6	19.8		
	Al-Naser Hospital	10	95.0	10.5		
	AL-Tahreer	5	25.0	43.3		
Disinfectant tools of ETT	**EUG**	3	91.7	14.4	28.539	0.000
	Al-Shifa Hospital	12	12.5	22.6		
	Al-Naser Hospital	10	100.0	0.0		
	AL-Tahreer	5	40.0	45.4		
Infection control procedures for the Suction process	**EUG**	3	81.5	8.5	10.851	0.000
	Al-Shifa Hospital	12	49.1	9.4		
	Al-Naser Hospital	10	72.8	13.7		
	AL-Tahreer	5	45.6	19.8		
Infection control Polices	**EUG**	3	86.7	23.1	5.774	0.004
	Al-Shifa Hospital	12	43.3	28.1		
	Al-Naser Hospital	10	88.0	19.3		
	AL-Tahreer	5	60.0	37.4		
Infection control Kits	**EUG**	3	53.3	23.1	1.717	0.188
	Al-Shifa Hospital	12	81.7	13.4		
	Al-Naser Hospital	10	68.0	21.5		
	AL-Tahreer	5	72.0	33.5		
Total	**EUG**	3	78.7	7.0	17.972	0.000
	Al-Shifa Hospital	12	44.9	7.5		
	Al-Naser Hospital	10	79.7	9.5		
	AL-Tahreer	5	48.3	25.0		
	Total	30	60.5	20.7		

Table 4.1 shows that the directobservation checklist to examine the commitment to principles of infection control in NICU in four hospitals that involve AL- shifa hospital, Al-Naser Hospital, AL-Tahreer Hospital and Finally EUG. Table (4.8) shows that there is statistically significant differences between all hospitals above concerning hand washing (F =24.807, P-value = 0.000), the differences are: for Al-Naser Hospital the mean is 95.0% followed by EUG 75.0% while the lowest mean is for AL- shifa hospital with the mean of 14.6% followed by AL-Tahreer Hospital with mean of 25%.Routine hand washing is one of the most importantstrategies to reduce nosocomial infections. In a2-year-long surveillance intervention with NICU patients,increased hand hygiene compliance (from 43 to80%) and that significantly reduced the incidence of respiratoryinfections from 3.35 to 1.06 infections per 1,000 patientdays(Cernada et al, 2014). On the other handthere is a statistically significant differences between disinfectant tools of ETT and hospitals (F =1.717, P-value = 0.000), the differences are: for Al Naser Hospital the mean is 100.0% followed by EUG 91.7% while the lowest mean is Shifa Hospital 12.5%.. According to infection control procedures for the Suction process there is a statistically significant differences between infection control procedures for the Suction process and hospitals (F =10.851, P-value = 0.000), the differences are for EUG the mean is 81.5% followed by Al Naser Hospital while the lowest mean was AL-TahreerHospital with mean of 45.6%. Endotracheal suctioning is used for eliminating bronchopulmonary secretions from the airway. Traditional open endotrachealsuction requires disconnection from the ventilator but now allowed endotrachealsuctioning without disconnection from the ventilator that called closed endotracheal suction systems (Foglia et al, 2007).

For Infection control Polices there is a statistically significant differences between infections control Polices and hospitals (F =5.774, P-value = 0.004).The differences are: for Al Naser Hospital the mean is 88.0% followed by EUG 86.7% while the lowest mean is

Shifa Hospital 43.3%. Concerning infection control Kits and supplies there is no statistically significant differences between Infection control Kits and hospitals (F =28.539, P-value = 0.188). Moreover educational interventions for Infection control Polices and efforts to improveadherence to hand hygiene have been associated with decreasedVAP rates(Foglia et al, 2007).

According to commit to principles of infection control in NICU there are statisticalsignificantdifferences between hospitals (F =17.972, P-value = 0.000),the differences are: forAl Naser Hospital, themean is 79.7% followed by EUG 78.7% while the lowest mean is ShifaHospital 44.9% followed byAL-Tahreer48.3%, although Shifa and AL-Tahreer are the main health care provider in NICU.

Chapter (5) Conclusion and Recommendation

This chapter provides the main conclusion and the recommendation for the health care provider and decision makers to recognize the risk factors concerning theincidence of VAP among neonates and to provide suggestion aiming to reduceit.

In order to improve the health of Palestinian neonates, it is expected that we can reduce morbidity and mortality by restricted the useof invasive devises in general,ULC, chest tube, urinary catheter, and necessity of blood transfusion sterility of any components, in addition toreducing the duration of intubation from ventilated babies,prevention protocols "health policies", programs and regulations that reduce exposure to these determinates.However, it is important to know the number of illnesses and deaths caused by each determinant before developing polices aim to improve public health.Reducing morbidity and mortality need cooperation and shared responsibilities with different governmental and non-governmental institutions to promote healthy procedures.

5.1 Conclusion

According to the results of this study, the researcher can conclude that different determinants could affect the health status of the neonates in GG and lead to VAP. These determinantsinclude neonatal, intubation profile, sensitivity of BAL culture and invasive devises. The researcher can conclude that the reduction of these determinates such as prolonged period of intubation, preterm deliveries, insert Ryle feeding, elective CS delivery, limited any component of blood transfusion, decrease times of ETT change will help in reducing the morbidity and mortality of neonates with VAP in GG. I suggest to train and supervise the health care team to comply with infection control protocols, in addition to give training course to the health care team,to use disposable ventilatorcircuits,to avoid unnecessary ULC, to use sterile chest tube and closed suction

proceduresand other invasive procedures. Finally, BAL cultures for early diagnosisof VAP should be used extensively.

5.2 Recommendations

According to the results of the current study, the following recommendations are suggested:

1. Implementingfuture researches about VAP problems in neonates toaccurately determine the morbidity and mortality of these problems in GG and estimate incidence of VAP among neonates.
2. Improving utilization of the CDC's protocol of respiratory infections will help in reducing the incidence of VAP in GG.
3. Using of aseptic technique to insertion of Ryle tubeespecially in ventilated babies.
4. Necessity of blood transfusion sterility of any components principally in ventilated babies.
5. A general rule, patients should be extubated as soon as possible is a main strategy to prevent VAP introducing.
6. Transferring the neonates who diagnosed VAP to isolation room at least 24 hours.
7. Activating the role of infection control committee to observe invasive devises procedures to reduce infection in NICU.

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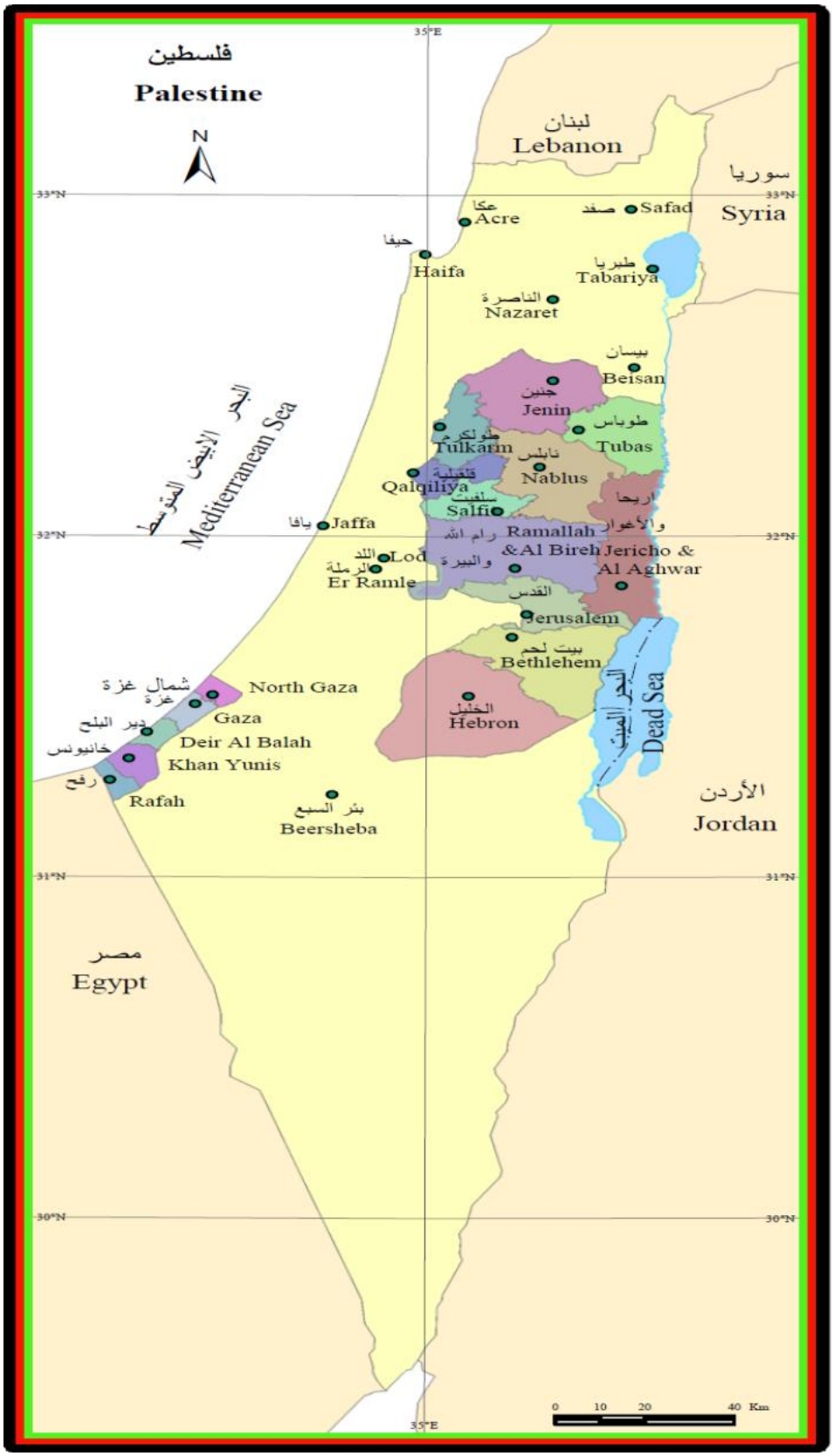
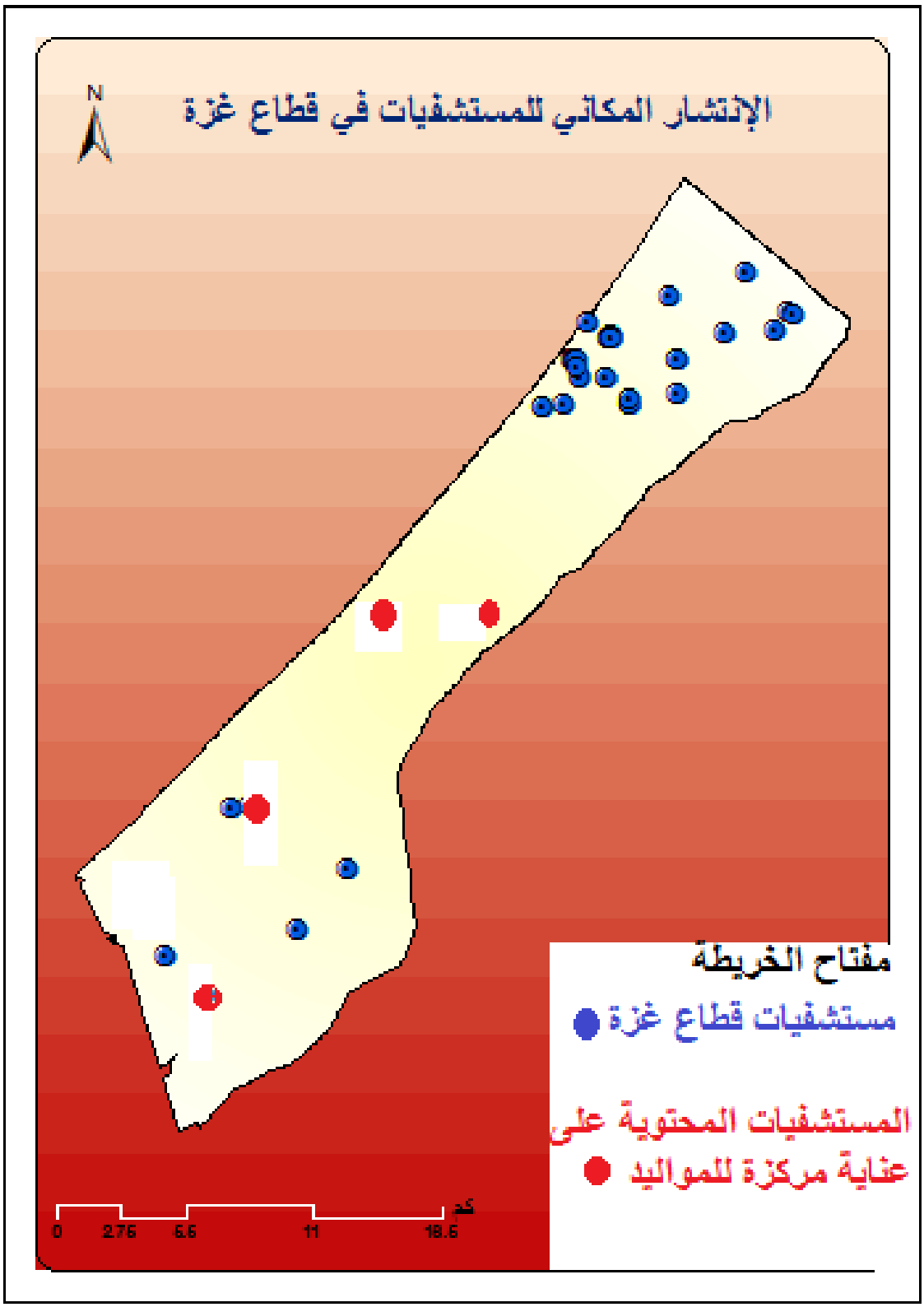
Annexes

Annex (1) Map of Palestine



From (PCBS, 2016)

Annexes (2) Distribution of Hospital in Gaza Strip



Annexes (3) Al-Quds University Approval Latter

Al-Quds University
Jerusalem
School of Public Health

جامعة القدس
القدس
كلية الصحة العامة

التاريخ ٢٠ /٢/٢٠١٦م

حضرة / د. ناصر أبوشعبان المحترم
مدير عام دائرة تنمية القوى البشرية – وزارة الصحة
السلام عليكم ورحمة الله،،،

الموضوع:مساعدة الطالب عبد الله رفيق اسماعيل مهدي

نشكر لكم دعمكم الدائم لمسيرة العلم والتعليم وخصوصاً دعم كلية الصحة العامة وطلابها، وعليه نرجو التكرم بالعلم بأن الطالب المذكور أعلاه تقوم بعمل بحث
Determinants of Ventilator-associated Pneumonia among Neonates-Gaza Governorates كمتطلب للحصول على درجة الماجستير في الصحة العامة
وعليه نرجو من سيادتكم التكرم بالموافقة على تسهيل مهمة الطالب في إنجاز هذا البحث بمشافي الوزارة .

شاكرين لكم حسن تعاونكم ودعمكم للمسيرة التعليمية،،،
و اقبلوا فائق التحية و الاحترام،،،

د. بسام أبو حمد
منسق عام برامج الصحة العامة
جامعة القدس–فرع غزة

نسخة:

Jerusalem Branch/Telefax 02-2799234
Gaza Branch/Telefax 08-2644220 -2644210
P.O. box 51000 Jerusalem

فرع القدس / تلفاكس 02-2799234
فرع غزة / تلفاكس 08-264420-2644210
ص.ب. ٥١٠٠٠ القدس

Annexes (4) MOH Approval Latter (Al-Shifa Hospital)

State of Palestinian

Ministry of health

دولة فلسطين

وزارة الصحة

التاريخ:07/03/2016

السيد : ناصرالدين رافت مصطفى ابوشعبان حفظه الله

مدير عام بالوزارة/الإدارة العامة لتنمية القوى البشرية - وزارة الصحة

السلام عليكم ورحمة الله وبركاته ...

الموضوع/ تسهيل مهمة باحث/ عبد الله رفيق مهدي

التفاصيل //

بخصوص الموضوع أعلاه، يرجي تسهيل مهمة الباحث/ عبد الله رفيق مهدي

-: الملتحق ببرنامج ماجستير الصحة العامة - مسار وبائيات - جامعة القدس ابوديس بغزة في إجراء بحث بعنوان

" Determinants of Ventilator Associated Pneumonia Among Neonates Gaza Governorates"

حيث الباحث بحاجة للإطلاع على الملف الطبي وتعبئة نموذج ملاحظة للأطفال المنومين في أقسام الحضانة في مستشفيات قطاع غزة، بما لا يتعارض مع مصلحة العمل وضمن أخلاقيات البحث العلمي و دون تحمل الوزارة أي أعباء أو مسئولية

...وتفضلوا بقبول التحية والتقدير

محمد ابراهيم محمد السرساوي

مدير دائرة/الإدارة العامة لتنمية القوى البشرية

المسئولية

- عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة) ← جميل محمد سليمان اخروات على سليمان(مدير مستشفى) لعمل اللازم
- عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة) ← مصطفى محمد محمد العطله(مدير) لعمل اللازم
- عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة) ← مصطفى سليم عبد الكحلوت(مدير مستشفى) لعمل اللازم
- عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة) ← مدحت عباس خضر حسن (مدير عام بالوزارة) لعمل اللازم
- عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة) ← جمال حامد عبد الحميد اليمص(مدير) لعمل اللازم
- محمد ابراهيم محمد السرساوي(مدير دائرة) ← ناصرالدين رافت مصطفى ابوشعبان(مدير عام بالوزارة) اجراءاتكم بالخصوص
- جمال حامد عبد الحميد اليمص(مدير) ← عمر عبد الله حسين الاسطل(مدير دائرة) للاطلاع و توجيهاتكم بالخصوص
- جمال حامد عبد الحميد اليمص(مدير) ← يسار محمد عبدالله مسلم(مدير دائرة التمريض) للاطلاع و توجيهاتكم بالخصوص
- جمال حامد عبد الحميد اليمص(مدير) ← محمد خليل محمد زقوت(مدير) للاطلاع و توجيهاتكم بالخصوص
- عمر عبد الله حسين الاسطل(مدير دائرة) ← ابتهال شكري شكور شبير(رئيس قسم ادارى) لعمل اللازم
- ناصرالدين رافت مصطفى ابوشعبان(مدير عام بالوزارة) ← عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة) اجراءاتكم بالخصوص

Annexes (5) MOH Approval Latter (Al-NaserPediatric Hospital)

State of Palestinian

Ministry of health

دولة فلسطين

وزارة الصحة

التاريخ:07/03/2016

السيد : ناصرالدين رافت مصطفى ابوشعبان حفظه الله
مدير عام بالوزارة/الإدارة العامة لتنمية القوى البشرية - /وزارة الصحة
السلام عليكم ورحمة الله وبركاته ,,,

الموضوع/ تسهيل مهمة باحث/ عبد الله رفيق مهدي

التفاصيل //

بخصوص الموضوع أعلاه، يرجي تسهيل مهمة الباحث/ عبد الله رفيق مهدي
الملتحق ببرنامج ماجستير الصحة العامة – مسار وبائيات - جامعة القدس ابوديس بغزة في إجراء بحث بعنوان :-

"Determinants of Ventilator Associated Pneumonia Among Neonates Gaza Governorates "

حيث الباحث بحاجة للإطلاع على الملف الطبي وتعبئة نموذج ملاحظة للأطفال المنومين في أقسام الحضانة في مستشفيات قطاع غزة، بما لا يتعارض مع مصلحة العمل وضمن أخلاقيات البحث العلمي و دون تحمل الوزارة أي أعباء أو مسئولية.

وتفضلوا بقبول التحية والتقدير،،،

محمد ابراهيم محمد السرساوي
- مدير دائرة/الإدارة العامة لتنمية القوى البشرية

7/3/2016

7.3.2016

بلات

اللطيف محمد محمد الحاج(مدير عام بالوزارة)	جميل محمد سليمان اخروات / علي سليمان(مدير مستشفى)	لعمل اللازم
اللطيف محمد محمد الحاج(مدير عام بالوزارة)	مصطفى محمد محمد العيله(مدير)	لعمل اللازم
اللطيف محمد محمد الحاج(مدير عام بالوزارة)	مصطفى سليم عبد الكحلوت(مدير مستشفى)	لعمل اللازم
اللطيف محمد محمد الحاج(مدير عام بالوزارة)	مدحت عباس خضر حسن (مدير عام بالوزارة)	لعمل اللازم
اللطيف محمد محمد الحاج(مدير عام بالوزارة)	جمال حامد عبد الحميد الهمص(مدير)	لعمل اللازم
د ابراهيم محمد السرساوي(مدير دائرة)	ناصرالدين رافت مصطفى ابوشعبان(مدير عام بالوزارة)	إجراءاتكم بالخصوص
رالدين رافت مصطفى ابوشعبان(مدير عام بالوزارة)	عبد اللطيف محمد محمد الحاج(مدير عام بالوزارة)	اجراءاتكم بالخصوص

Gaza Tel. (+970) 8-2846949 Fax. (+970) 8-2826295
غزة تلفون. (+970) 8-2846949 فاكس. (+970) 8-2826295

2

3/7/2016 11:53 AM

Annexes (6) Helsinki CommitteeApproval Latter

المجلس الفلسطيني للبحث الصحي

Palestinian Health Research Council

تعزيز النظام الصحي الفلسطيني من خلال مأسسة استخدام المعلومات البحثية في صنع القرار

"Developing the Palestinian health system through institutionalizing the use of information in decision making"

Helsinki Committee
For Ethical Approval

Date: 20/04/2016 **Number:** PHRC/HC/91/16

Name: Abedalla R. Mahdi **الاسم:** عبد الله مهدي

We would like to inform you that the committee had discussed the proposal of your study about:

نفيدكم علماً بأن اللجنة قد ناقشت مقترح دراستكم حول:

Determinants of Ventilator-associated Pneumonia among Neonates-Gaza Governorates

The committee has decided to approve the above mentioned research. Approval number PHRC/HC/91/16 in its meeting on 20/04/2016

و قد قررت الموافقة على البحث المذكور عاليه بالرقم والتاريخ المذكوران عاليه

Signature

Member **Member**

Chairman

Genral Conditions:-

1. Valid for 2 years from the date of approval.
2. It is necessary to notify the committee of any change in the approved study protocol.
3. The committee appreciates receiving a copy of your final research when completed.

Specific Conditions:-

E-Mail:pal.phrc@gmail.com

Gaza - Palestine غزة - فلسطين

Annexes (7) Cover Letter and Consent Form

Cover Latter

Determinants of Ventilator-associated Pneumonia among Neonates-Gaza Governorates cross sectional study

Dear Dr.

This study is conducted as a part of the requirement for the Master Degree in Public health at Al-Quds University.

General objective:

To assess main determinates for development ofVAP among neonates in Gaza Governorates. Thus the study findings may contribute to estimate the incidence rate of neonatal VAP in ICU in Gaza governorates. To achieve the objectives of this study, the researcher built direct observation checklist sheet through reviewed literatures and previous studies.

Kindly, read the direct observation checklist, give your opinion and write your suggestion. Certainly, your advice and suggestions will contribute to achieve the research objectives.

Sincerely,

Abedalla Mahdi

Annexes (8)Firstobservation checklist sheet

1. Neonatal information		
1.1 Gender M☐e F☐ale	**1.2Date of admission**---\---\-----	**1.3 Serial number** ☐☐☐
1.4 Address Gaza city ☐North Gaza ☐Middle zone Khan ☐unisRafah ☐ ☐		
1.5 Hospital name ☐ AL- Shifa Hospital ☐ Khan Younis Hospital ☐Al-Naser pediatric Hospital E☐ppean Gaza Hospital		
2. Neonatal profile		
2.1 Gestational age Premature ☐ Full term ☐ Post term ☐ 2.1.1 If the patient premature how many of gestational age ---------- weeks. 2.2 Birth weight: ---------- KG. 2.3 Type of delivery ☐ C.S. ☐ NVD ☐ Vacuum ☐ Forceps		
3. Intubation profile		
3.1 Length of intubation ☐ Between 48-72hr ☐ 72-120hr ☐ More than 120hrs		
3.2 How many times endotracheal tube was changed ----------time/s		
4. Bronchoalveolar lavage culture and sensitivity profile		
4.1 Results of the BAL cultures ☐ Positive culture ☐ Negative culture 4.1.1If culture positive determine ☐ Gram-positive ☐ Gram-negative 4.2.1 Name of the causative microorganism ----------		
5. Invasive devices profile		
5.1 Chest tube present ☐ yes ☐ No 5.2 Umbilical line catheter present ☐ yes ☐ No 5.3 urinary catheter present ☐ yes ☐ No 5.4 Ryle tube present ☐ yes ☐ No		

5.5 Administration blood products

☐ yes ☐ No

5.5.1 If yes ☐ Plasma ☐ Pocket RBS ☐ Human albumin

6. Chest x-ray

6.1 How many chest x-ray was perform before intubation process ----------time\s

6.2 How many chest x-ray was perform after intubation process ----------time\s

6.2.1 Chest x-ray result

Chest infiltration in the chest x-ray

☐ Yes ☐ No

7. Clinical sings of neonates

7.1 Heart rate by monitors measurement ---------- beats/min

7.2 Body temperatures for neonate by thermometer ---------- c°

7.3 Respiratory rate for neonate by monitors measurement ---------- breath/min

7.3.1 Neonates enter apnea

☐ yes ☐ No

7.3.2 How many time ---------- time\s

Medical diagnosis of neonates8.

8.1 medical Cause of admission

☐ Respiratory distress ☐ Birth asphyxia ☐ Sepsis

☐ Premature ☐ Congenital anomalies ☐ others

Laboratory test 9.

9.1 Complete blood count Result

Red blood cells ----------ML White blood cells ---------- ML Platelet ----------

MLHemoglobin----------DL

9.2 Arterial blood gases result

PH ----------

PaO2 mmHg ----------

PaCo2 ----------

9.3 Blood culture results

☐ Negative ☐ Positive

9.3.1 If results positive

☐ Gram-positive ☐ Gram-Negative

9.3.2 causative microorganism ----------

Annex (9) List of expert's names who reviewed the study Observation checklist sheet:

Name	Position
Dr. Yehia Abed	Al Quds University
Dr. Khitam Abu Hamad	Al Quds University
Dr. Shereen Abed	MOH- Al Nasser pediatric hospital
Dr. Allam Abu Hamda	MOH- AL- Shifa Hospital
Dr. Hanan Alwadea	MOH- AL- Shifa Hospital
Dr. Mohammad Shubair	Islamic University
Mr. Ahmed Afifi	MOH- Al Nasser pediatric hospital

Annexes (10) Second observation checklist sheet

الرقم	البيان	نعم	لا	إذا الجواب هو نعم اذكر بالتفصيل
	المحور الأول: غسل اليدين			
.1	هل يتم غسل اليدين قبل عملية التشفيط للمولود الجديد المرتبط بجهاز التنفس الصناعي .			
.2	هل يتم غسل اليدين بعد عملية التشفيطللمولود الجديد المرتبط بجهاز التنفس الصناعي .			
.3	هل يتم غسل الأيدي في حالة التعامل مع المريض الواحد لأكثر من تدخل.			
.4	هل يتم غسل اليدين بالشكل الصحيح حسب منظمه الصحة العالمية.			
	المحور الثاني: نظافة الأدوات الازمة لعملية تثبيت (ETT).			
.5	هل يتم تنظيف وتطهير الأدوات التي يتم استخدامها في تثبيت (ETT).			
.6	هل يتم تنظيف أجهزة التنفس الصناعي بمادة مطهرة.			
.7	هل يتم تنظيف معداتlaryngoscopبمادة مطهرة.			
.8	هل يتم تنظيف Ambu Bag Mask بمادة مطهرة بعد كل مريض.			
	المحور الثالث: إجراءات ضبط العدوى لعملية التشفيط			
.9	هل يتم ارتداء القفازات المعقمة بشكل صحيح.			
.10	هل يتم تغير أنابيب الشفط بعد خروج المرضى (Suction connection)			
.11	هل يتم استخدام مقاس أنبوب الشفط المناسب للمولود الجديد المرتبط علي جهاز تنفس صناعي.			
.12	هل يتم اعادة استخدام أنبوب الشفط المناسب للمولود الجديد المرتبط علي جهاز تنفس صناعي أكثر من مرة.			
.13	هل يتم إعادةتعقيم أنابيب الشفط بعد خروج المرضى (Suction connection)			
.14	هل يتم وضع مادة مطهرة داخل مخزن جهاز الشفط أثناء وجود المرضى.			
.15	هل يتم وضع ماء مقطر فقط (بدون إضافة مواد مطهرة) داخل مخزن جهاز الشفط أثناء وجود المرضى.			
.16	هل يتم إفراغ مخزن جهاز الشفط من أي سوائلبعد خروج المرضى.			
.17	هل يتم إجراء عملية الشفط (Suction) بطريقة معقمة.			
.18	هل يتم الالتزام بالزمن المحدد من (8- 9) ثواني عند التشفيط للمولود الجديد المرتبط علي جهاز التنفس الصناعي.			
.19	هل يتم ضبط (suction pressure) من (80-120) قبل البدء بعملية التشفيط للمولود الجديد المرتبط علي جهاز التنفس الصناعي.			
.20	هل يتم استخدام الحجم المناسب لتركيب ETT للمولود الجديد المرتبط علي الجهاز التنفس الصناعي.			
.21	عند استخدام محلول ملحي (Normal saline 0.9%) خلال عملية			

	الشفط, هل يتم تحضير المحلول بطريقة معقمة.			
22.	هل يتم التأكد من صلاحيات المحلول الملحي.			
23.	هل يتم التأكد من تاريخ انتهاء صلاحية المواد المعقمة قبل الاستخدام.			
24.	هل يتم تغيير جهاز ترطيب الهواء بجهاز التنفس الصناعي بعد خروج الحالات.			
25.	هل يتم تغيير أنابيب جهاز التنفس الصناعي بعد خروج المرضى.			
26.	هل المستلزمات والادوات اللازمة للالتزام بإجراءات ضبط العدوى متوفرة في القسم بشكل كافي.			
المحور الرابع: سياسات ضبط العدوى				
	هل هناك سياسة مكتوبة للقسطرة الوريدية المركزية (Umbilical Line)			
	هل هناك سياسة مكتوبة لمنع عدو الجهاز التنفسي المكتسب من الجهاز التنفس الصناعي.			
	هل هناك سياسة مكتوبة عن إجراءات عزل الحالات المصابة بالالتهابات الجهاز التنفس المكتسب من جهاز التنفس الصناعي.			
	هل يتم رصد وإحصاء حالات التهاب الجهاز التنفسي المكتسب من الجهاز التنفس الصناعي.			
	هل يتلقى الطاقم دورات تدريبية أو محاضرات حول سياسات ضبط العدوى.			
المحور الخامس: مستلزمات ضبط العدوى.				
	هل يتوفر صابون سائل.			
	هل يتوفر صابون معقم.			
	هل يتوفر كحول.			
	هل يتوفر جهاز hand rub .			
	هل يتوفر منشفة ورقية.			

Annex (11) List of expert's names who reviewed the study Observation checklist sheet:

Name	Position
Dr. Yehia Abed	Al Quds University
Dr. Anwar Alshaikhkhalil	Consultant Pediatrician and Neonatologist- Islamic University
Dr. Khitam Abu Hamad	Al Quds University
Dr. Shereen Abed	MOH- Al Nasser pediatric hospital
Dr. Allam Abu Hamda	MOH- AL- Shifa Hospital
Dr. Hanan Alwadea	MOH- AL- Shifa Hospital
Dr. Mohammad Shubair	Islamic University

Annex (12) Arabic abstract

ملخص الدراسة

محددات الالتهابات الرئوية التي لها علاقه بالجهاز التنفسي الصناعي بين حديثي الولادة في محافظات غزة

الباحث: عبدالله رفيق مهدي

إشراف: د. يوسف عوض

مقدمة

الالتهابات الرئوية المرتبطة بالجهاز التنفس الصناعي حسبمركزالسيطرةعلىالأمراض:هي الالتهابات الرئوية التي تحدث عند المريض بعد مرور أكثر من 48 ساعة من وصل المريض على جهاز تنفس صناعي.

الالتهابات الرئوية المرتبطة بجهاز التنفس الصناعي تعتبر في المرتبة الثانية من الالتهابات المكتسبة من داخل المستشفيات , سواء في الاطفال أو المواليد الجدد.

تنقسم الالتهابات الرئوية المرتبطة بجهاز التنفس الصناعي إلىقسمين: حدوث التهاب مبكر يحدث في أول أربعة أيام من وصل المريض على جهاز التنفس الصناعي,وهذا النوع يستجيب للمضادات الحيوية. أما القسم الثاني هو حدوث التهابات متأخرة تحدث بعد خمسه أيام من وصل المريض على جهاز التنفس الصناعي, وهذا النوع مقاوم لمعظم المضادات الحيوية بالإضافة إلى غياب المعايير الذهبية لتشخيص مرض الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي، وخاصة عند المواليد الجدد.

هنالك العديد من المحددات ارتبطت بشكل مباشر في حدوث الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي؛ منها طول فترة وضع المواليد الجدد علي جهاز التنفس الصناعي حيث إنها تعتبر واحدة من أهم هذه العوامل , بالإضافة إلى عدد مرات تغيير الأنبوب الرغامي المركب علي حديثي الولادة , وكذلك أيضاً نقل أي من مركبات الدم إلىحديثي الولادة.

أهداف الدراسة :

- معرفة المحددات التي أدت إلى حدوث الالتهابات الرئوية المرتبطة بجهاز التنفس الصناعي ما بين الناجين والمصابين بهذا النوع من الالتهاب.
- معرفة العلاقة بين الإجراءات المستخدمة النافذة لجسم حديثي الولادة (القسطرة البولية، القسطرة السرية، التغذية عن طريق الأنابيب، الأنبوب البلوري الصدري، ونقل أحد مكونات الدم) وحدوث الالتهابات الرئوية المرتبطة بجهاز التنفس الصناعي.
- تحديدالمحدداتالأكثرشيوعاًمنالالتهابات الرئوية المرتبطة بجهاز التنفس الصناعي وأثارها على حديثي الولادة.

- تقديم اقتراحات وتوصياتلاتخاذإجراءاتللحدمنالإصابة بالالتهابات الرئوية المرتبطة بجهاز التنفس الصناعي علىصحةحديثيالولادةبوحدةالحضانة في أقسام العناية المركزة فيمحافظاتغزة.

منهجية الدراسة

هذه الدراسة دراسة وصفية تحليلية، وهي دراسة واقعة ما بين 1 مايو 2016 و 10 أغسطس 2016, حيث درست الحالات المرضية خلال فترة 100 يوم.

عينة الدراسة

تكونت عينة الدراسة من 102حالة مرضية موزعة على 4 مستشفيات: (مستشفى الشفاء (47 حالة)، مستشفى خانيونس (25حالة)، مستشفى النصر للأطفال (21 حالة)، مستشفى غزة الأوروبي (9حالات))، مع العلم أن جميع الحالات هي مواليد جدد تقل أعمارهم عن 28 يوماً , وموصولون على جهاز تنفس صناعي لأكثر من 48 ساعة، وقد تم تشخيصهم من قبل الباحث والأطباء معاً من خلال صور الأشعة العادية ووُجد أن فيهاالتهاباً رئوياً, وقد قام الباحث بمراقبة العلامات الحيوية وعمل فحوصات وهي: (فحص الدم الكامل (CBC)، وعينة غازات الدم، عمل مزرعة للإفرازات والسوائل الموجودة في الأنبوب الرغامي، وعمل مزرعة للدم).

كيفية جمع البيانات

جُمعت البيانات من خلال المراقبة المباشرة للمريض؛ حيث صُممت هذه الأداة لهذا الغرض وهي من إعداد الباحث، وشملت هذه المراقبة المباشرة مجالات عديدة منها:المعلومات الشخصية للمولود، العلامات الحيوية , ونتائج الفحوصات والتحاليل الطبية الخاصة بكل مريض,والخصائص الصحية والعادات السلوكية للفريق الصحي عند التعامل مع المريض مثل عدد مرات تغيير الأنبوب الرغامي ومدة وضع المولود على جهاز التنفس الصناعي، بالإضافة الى أداة جديدة من خلال المراقبة المباشرة وهي مبادئ الالتزام بضبط العدوي وقد تم فحص صدق وثبات الأداتين السابق ذكرهما وذلك من قبل المحكمين بالإضافة لتطبيق الملاحظة المباشرة على عينة استطلاعية قبل البدء بالدراسة. كما التزم الباحث بالمعايير الأخلاقية البحثية.

تحليل البيانات

تم استخدام برنامج الرزم الإحصائية للعلوم الإجتماعية "SPSS" لمعالجة البيانات إحصائياً؛ حيث تم اختبار النتائج باستخدام، Chi-square، P-value ، ANOVA، لفحص العلاقة بين المحددات.

أهم النتائج

بينت هذه الدراسة العديد من المحددات والتي يُعتقد بأنهاسيكون لها الأثر المباشر في الإصابة بالالتهابات الرئوية المرتبطة بجهاز التنفس الصناعي،والتي يمكن التحكم بها وكان لها دلالة إحصائية وهي:

- بلغ معدل الإصابة بمرض الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي عند المواليد حديثي الولادة في محافظات غزة خلال فترة 100 يوم حوالي 42.2%، حيث كان مستشفى الشفاء أعلى نسبة إصابة حيث بلغت 41.9%، يليه مستشفى خانيونس 37.2%، يليه مستشفى النصر 18.6%، وأخيراً مستشفى غزة الأوروبي 2.3%.
- وجدت الدراسة أن التغذية ممن خلال الأنبوبونقل الدم ومكوناته بالاضافة الى وجود القسطرة البولية والأنبوب المثبت في التجويف الصدري (chest tube) هي من أكثر محددات الإصابة بمرض الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي عند المواليد حديثي الولادة في الإجراءات المستخدمة النافذة لجسم حديثي الولادة.
- وجدت الدراسة أن طول فترة مكوث المولود على جهاز التنفس الصناعي لأكثر من 120 ساعة يزيد من فرص حدوث الإصابة بمرض الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي عند المواليد حديثي الولادة.
- وجدت الدراسة أن مزرعة الدم الموجبة من أكثر محددات الإصابة بمرض الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي عند المواليد حديثي الولادة.
- بينت الدراسة أن الولادة القيصرية والولادة الطبيعية الصعبة تزيد من محددات الإصابة بمرض الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي عند المواليد حديثي الولادة.

التوصيات

من أهم التوصيات التي خرجت بها هذه الدراسة:

- وضعقاعدةبياناتوطنيةلضماندقة السجلات الطبية بشكل عام وخاصة عن المواليد حديث الولادة فيفلسطين.
- إجراءالمزيدمنالأبحاثحولمشكلةمرض الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي عند المواليد حديثي الولادة للوصول إلى معدلات دقيقة للمراضة والوفياتمنهذهالمشكلةفيفلسطين.
- تقليلالولاداتالقيصريةالاختياريةوخاصةفيالمراكزوالمستشفيات الخاصة.
- الاستفادةمنبروتوكولمركزالسيطرةعلىالأمراضالتهاباتالجهازالتنفسييساعدفيالحدمنحدوثمرض الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي عند المواليد حديثي الولادة في محافظات غزة.
- تطبيقالدراساتالمستقبليةحولقسمضبط التحكم وتقليل العدوى.
- تقليل استخدام التغذية عن طريق الأنبوب خاصةفيالمواليد التي تطول فترة مكوثهم على أجهزة التنفس الصناعي قدر الإمكان.
- التقنين من تغيير الأنبوب الرغامي قدرالإمكان أو عند الضرورة.

- التقنين في نقلأيمنمكوناتالدمللمواليد حديثي الولادة قدرالإمكان.
- وضع المواليد حديثي الولادة الذين شُخصوا بمرض الالتهاب الرئوي المرتبط بجهاز التنفس الصناعي في غرفةالعزلفيما لا يقلعن 24 ساعة.
- تقديمدراساتعاجلةلتقييمفعالية(VAP Bundle)فيمحافظاتغزة.
- تفعيل التثقيف الصحي للكادر الصحي العامل في أقسام العناية المركزة لحديثي الولادة عن طرق الوقاية والعلاج خصوصاً للالتهاب الرئوي المرتبط بجهاز التنفس الصناعي عند المواليد حديثي الولادة.