EFFECTIVENESS OF INFECTION CONTROL PROTOCOL ON KNOWLEDGE AND PRACTICE AMONG NICU NURSES AT SELECTED HOSPITALS, KANYAKUMARI DISTRICT, 2011.

DISSertation SUBMITTED TO
THE TAMIL NADU DR.M.G.R.MEDICAL UNIVERSITY
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MAY 2012
EFFECTIVENESS OF INFECTION CONTROL PROTOCOL ON KNOWLEDGE AND PRACTICE AMONG NICU NURSES AT SELECTED HOSPITALS, KANYAKUMARI DISTRICT, 2011.

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ABSTRACT

A Quasi experimental study to assess the effectiveness of infection control protocol on knowledge and practice among NICU nurses working at selected hospitals, Kanyakumari District.

INTRODUCTION

Neonates who are getting admitted to Neonatal Intensive care units are at high risk for developing various infections, because of their lowered resistance to infections, microorganisms, increased exposure to different types of organisms and various invasive procedures. Hospital is one of the most likely places for acquiring an infection since it harbors antibiotic resistant micro-organisms. Nosocomial infections are a significant problem in Neonatal intensive care units. For reducing the incidence of nosocomial infection, each NICU should have an infection control program. Well-directed infection control activities can reduce the nosocomial infection rates. Adequate and well trained nursing staffs are essential for infection control. Education of the nurses about infection control practices and standard practice guidelines has an important role in the reduction of nosocomial infections. As a member of the interdisciplinary care team, the nurse can work with other health care professionals to prevent the risk of nosocomial infection in the NICU.

Objective

To assess the effectiveness of infection control protocol on knowledge and practice among NICU nurses.

METHODOLOGY

Quasi experimental non equivalent control group post test only design.
Setting

Neonatal Intensive Care Units of PPK hospital and Grace Hospital, Kanyakumari District.

Measurements and Tools

The level of knowledge was assessed using structured questionnaire and practice was assessed using Observational checklist based on AIIMS and WHO practical guide.

Intervention

Infection control protocol was given for NICU nurses working at neonatal intensive care units of selected hospitals.

RESULTS

The post test mean score in Group A was 28.3 and S. D 1.29 and the post test mean score in Group B was 17.70 and S. D 1.26. The calculated ‘t’ value was 31.227 which showed high statistical significance at p < 0.001 level.

DISCUSSION

There was a significant improvement in the knowledge and practice of NICU nurses in Group A after administering the infection control protocol to be followed in the NICU. Thus the infection control protocol was effective in improving the knowledge and practice among NICU nurses.

Implication for Clinical practice

The NICU nurses should update their knowledge by attending seminars, continuing educational programme, workshop and conferences. All the nurses who cares the critically ill neonates should be equipped with the knowledge and practice on infection control measures in NICU. By providing infection control protocol nurse’s can reduce the risk of nosocomial infections in neonatal intensive care unit.
CHAPTER – I

INTRODUCTION

BACKGROUND OF THE STUDY

Neonatal period signifies the beginning of life as an independent individual who is the future citizen of nation. Neonatal period is the single most hazardous period of life: never again in life is the individual confronted with more dramatic challenges than in the transitional period from dependent intrauterine life to independent extra uterine life. This neonatal period is a continuation of fetal growth and development. This is the period for the neonate to face many life threatening problems which leads to increased mortality and morbidity if proper care is not given.

Children are physically, psychologically and emotionally immature and differ from adults in several ways; hence it is each one’s responsibility to nurture the child to become a healthy individual.

Infection is the common cause for mortality and morbidity in pediatric hospitals. Multiple factors contribute towards exposing children to the risk of infection when hospitalized. Among them hospital acquired infection is the common factor.

Infection was recognized as a major preventable cause of neonatal mortality and morbidity. Apart from the emphasis on general measures of asepsis in the care of newborn, infection control measures also must be followed in the neonatal intensive care unit.
Infection refers to invasion and multiplication of microorganisms in body tissues, especially that causing local cellular injury due to competitive metabolism, toxins, intracellular replication or antigen – antibody response.

Nosocomial infections are major concerns in the management of clients in hospitals and are growing problem in developed and developing countries because of increased mortality and morbidity rates and corresponding costs.

**Nosocomial infection** also called **Hospital acquired infection** is an infection acquired in hospital for a reason other than infection. An infection occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission (WHO, 2010). This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility.

Nosocomial infections are infections acquired from the hospital due to improper skin care, poor hand washing technique, failure to use aseptic techniques during dressings, improper disposal of wastes, contaminated respiratory care equipments, improper disposal of waste, contaminated respiratory care equipments, and improper care of intravenous and lack of barrier techniques.

Children admitted in Intensive Care units will develop more infections due to critical nature of the disease, invasive procedures done in NICU and presence of invasive catheter such as urinary catheter, central venous catheter, arterial line and pulmonary catheter and endotracheal tube. Extended hospital stay, increased disability and prolonged recovery time all influence the risk of infection.

Children who are getting admitted to Neonatal Intensive care units are at high risk for developing various infections, because of their lowered resistance to infections, microorganisms, increased exposure to different types of organisms and
various invasive procedures. Hospital is one of the most likely places for acquiring an infection since it harbors antibiotic resistant micro-organisms.

Children admitted to Intensive care units are more susceptible to infection due to various reasons such as immature immune system, limited ability to resist infections and immature T-lymphocytes (Bellanti, 2009).3

Nosocomial infections are serious health problem in the world and affects 9.2% of children, which, in an average extra hospital stay of 4 days (Molly Coustesay, 2009).6

Prevalence rate of nosocomial infection among pediatric client in India varied from 11.2% to 24.4% which is very high comparing to world level (Shekhawat, 2009).6

**Global Scenario of Nosocomial infection among Hospitalized Children:**

**International Level:**

Healthcare associated infections are estimated to occur in 5% of all hospitalizations in the United States. In 2008, Point prevalence surveys in pediatric Intensive care units and neonatal intensive units showed 11.9% had PICU acquired infections and 11.4% had NICU acquired infections.

The statistical data showing neonatal mortality rate in some developed and developing countries per 1000 live births in the year 2009 respectively, in India 39, Bangladesh 36, Nepal 32, Srilanka 8, Pakistan 53, China 18, United Kingdom 3 and U.S.A 4.

**India (2010):**

In India, neonatal mortality rate estimated in the year 2010 is about 25 per 1000 live births in early neonatal period and neonatal mortality rate for the whole country is about 37/1000 live births.
The incidence of nosocomial infection in NICU and PICU due to use of mechanical ventilation, indwelling catheter and invasive monitoring is higher than other wards. In India incidence rate is 18.3% for Nosocomial infection in PICU setting and 27.3% in NICU setting. Incidence of nosocomial infection in India showed that the duration of mechanical ventilation and duration of stay in NICU and PICU increased the risk of developing nosocomial infection.

The commonest nosocomial infections in NICU and PICU are blood stream infection (20% -30%), lower respiratory tract infections (20% -35%), Sepsis (35% - 45%) and urinary tract infections (21%). Sepsis is the most common cause of nosocomial infection.

Among pediatric clients, children younger than 1 year, babies with extremely low birth and children in either the PICU or NICU have higher rates of healthcare associated infections.

According to National neonatal forum (2009), the neonatal death rate is 35 per 1000 live births which was 70 per 1000 live births in 2009. Still the neonatal mortality in India is nearly 5-10 times more than in developed countries.

Various measures can be adopted to prevent hospital acquired infections. This can be proper hand washing, use of gloves, gown, mask and goggles, isolation of children with infection, proper sterilization of articles, aseptic precautions, proper waste management and surveillance for infection. Nurses play an important role in infection control. Nurse can prevent the onset and spread of infection and also promote measures for treatment of infections. The nurses come in contact with variety of microorganisms and thus must practice infection control techniques to avoid spreading them to other children. Infection control team also contributes to the reduction of nosocomial infections.
The nurse in NICU is responsible for giving care to critically ill children and whose life in many ways depends on care providers. Nursing children in NICU is challenging and exciting because conscious vigilant care every minute decreases the morbidity, mortality, length of the hospital stay and on the financial concern of family, hospitals and the community. Since the children are separated from their home environment during Hospitalization and do not possess the capacity for abstract thinking and reasoning, it is the responsibility of every individual who comes in contact with them to maintain protective measures throughout their hospital stay.

**NEED FOR THE STUDY**

Now science and technology are rapidly advancing and progressing. Moreover the health care consumers are well aware about rights and cost effective quality care. So the nurses are pressurized to render high quality care based on evidence based practice. Nurses in Intensive care units need to have more skills and update their scientific knowledge in order to cope up with challenging practices in child care settings.

Neonatal nursing being a specialized branch of nursing, demands a high standard of nursing care. A neonatal nurse is expected to have a sense of responsibility, devotion to work, keen sense of observation, alertness and readiness to take a quick decision. Nurse plays a vital role in the health care of neonates.

Neonatal nurses who are able to plan and carryout nursing care with knowledge, practice and confidence are better ambassadors for their specialty.

*Health care infection control team (2009)* identified that approximately 20 lakhs children develops hospital acquired infection and 88,000 children die from that and it is the fourth leading cause of death of children.
Nosocomial infections can result in many complications, such as meningitis, wound infection, respiratory tract infection, urinary tract infection, pressure ulcers and thrombophlebitis. So the nurses should be aware about possible risk factors which contribute to this infection. Their Observational skills and knowledge sharpened by experience which facilitates the quality and competent care to critically ill children.

Chitnis et al (2011)\(^{35}\) conducted a study in India among 200 clients in NICU and PICU on incidence of nosocomial infection and identified that 27% had respiratory tract infection, 7% had urinary tract infection, 18.1% had surgical site infection and 16% had intravenous site infection.

A well-defined policy for the prevention and survey of nosocomial infection is necessary in all departments particularly in intensive care units. Prevention of nosocomial infection requires regular daily actions implicating the entire health care team (CDC Guidelines, 2011)\(^{79}\).

Sharis R .et al (2010)\(^{68}\), in his article stated that hand disinfection is the most important and least expensive measure in preventing the transmission of Hospital acquired infection. Compliance, however rarely exceeds 40% even in Intensive Care units which reflects the intensive and incessant educational infection control programme.

Giger H, Grote J (2009)\(^{45}\) conducted a study on impact of teaching interventions on nurses compliance with infection control practices and determined that compliance with infection control practices can be improved by targeted teaching and supportive structural improvement and this positive impact may persist even after targeted teaching activities have ended.
Curry V.J and Cole.M (2009) stated that Infection control nurses play several important role as Surveyors, educators, ultimately change agent in the identification and prevention of nosocomial infections in the hospital.

Trotter C and Dande (2009) conducted a descriptive study on neonatal nurse practitioners and their role as advanced practitioners in neonatal intensive care unit. They found that both professionals and families were very satisfied with the neonatal nurse practitioners clinical skills, knowledge base and their contributions to neonatal care.

Martin (2009) stated that to provide qualitative and competent care, the neonatal nurse should possess knowledge and adequate skills. This can be achieved by incorporating the existing knowledge and skill with clinical practice guidelines.

Nurses are performing various roles in the Health care settings and it varies from minor wound care to, till assisting with major surgeries Nurses are with the children in Intensive Care units round the clock and monitor the progress in health care and deviation from prognosis. Moreover nurses assist and manage in all emergency situations. While trying to save the life of the children in these emergency situations health care professionals may tend to forget the preventive aspect of care and rather carries infection to other children too.

The investigator believes that, nurses who are involved in the care of neonates are the best monitors and they need continued in-service training in the art of neonatal nursing for providing qualitative and competent care of the neonates. The need for experienced and qualified nurses caring for sick neonate in neonatal intensive care unit has been widely recognized by professional organizations.

From the Investigator’s previous working experience in NICU, it is generally felt that current training methodology and training facilities for nurses are not sufficiently equipped to deal with the problems of the neonates. Hence the
investigator took a step to prepare and provide Infection control protocol as an informal educational programme to nurses. The Protocol was prepared with an aim to improve the quality and to prevent the occurrence of nosocomial infections among children.

**STATEMENT OF THE PROBLEM**

A quasi experimental study to assess the effectiveness of infection control protocol on knowledge and practice among NICU nurses working at selected hospitals, Kanyakumari District.

**OBJECTIVES**

1. To assess the post intervention level of knowledge and practice on infection control protocol among NICU nurses in group A and group B.
2. To compare the post intervention level of knowledge and practice on infection control protocol among NICU nurses between group A and group B.
3. To correlate the level of knowledge with level of practice on infection control protocol among NICU nurses in group A and group B.
4. To associate the knowledge and practice scores on infection control protocol with selected demographic variables of NICU nurses in group A and group B.

**OPERATIONAL DEFINITION**

**Effectiveness**

Refers to the outcome of infection control protocol in terms of gained knowledge and improved practice will be assessed using structured questionnaire devised by the investigator and observational checklist based on modified AIIMS and WHO practical guide.

**Infection Control Protocol**

Refers to the set of instructions developed and administered by the investigator to the NICU nurses on infection control measures to be followed in the
neonatal intensive care unit through lecture cum demonstration and reinforcing through video show and return demonstration which includes

- General Information on nosocomial infections.
- Before Entering into the neonatal intensive care unit
- Working in the neonatal intensive care unit.
- On exit from the neonatal intensive care unit.

3. **Knowledge**

   Refers to an understanding and ability of the NICU nurses to answer questions regarding infection control protocol to be followed in the Neonatal intensive care unit which is assessed using structured knowledge questionnaire which includes 4 components

   - General Information
   - Before entering into the neonatal intensive care unit.
   - Working in the neonatal intensive care unit.
   - On exit from the neonatal intensive care unit.

4. **Practice**

   Refers to the ability of nurses to perform the steps of Infection control protocol in the neonatal intensive care unit and is evaluated using observational checklist based on modified AIIMS and WHO practical guide.

5. **NICU Nurses**

   Refers to registered nurses working in various levels (Level I, Level II and Level III) of neonatal intensive care unit with minimum experience of above 6 months.

6. **Neonatal Intensive Unit:**

   Refers to special units in the hospital including Level I, Level II and Level III neonatal intensive care unit in which only critical care children are admitted and taken care of by Health care professionals.
ASSUMPTIONS

1. Nurses may have some knowledge and practice on Infection control measures.
2. Imparting information regarding Infection control protocol may enhance level of knowledge and practice among staff nurses.
3. Adequate information regarding infection control protocol may help to prevent the risk of nosocomial infection in the neonatal intensive care unit.

NULL HYPOTHESES

NH$_1$: There is no significant difference between the post intervention level of knowledge and practice regarding infection control protocol among NICU nurses in group A and group B at p<0.001.

NH$_2$: There is no significant correlation between the post intervention level of knowledge with practice regarding infection control protocol among NICU nurses in the group A and group B at p<0.001.

NH$_3$: There is no significant association between the post intervention level of knowledge and practice regarding infection control protocol among NICU nurses with the selected demographic variables in the group A and group B at p<0.001.

DELIMITATION

The study is delimited to the period of 4 weeks.

CONCEPTUAL FRAMEWORK BASED ON IMOGENE KING’S GOAL ATTAINMENT THEORY

This part deals with conceptual framework adapted for the study. A conceptual framework is comprised of interrelated concepts that explain natural phenomena. The concepts are linked together to express the relationship between them. It is a schematic representation of the steps, activities and outcome of the study.
Investigator adopted “Imogene King’s Goal Attainment Theory” which is aimed to find out the effectiveness of infection control protocol on knowledge and practice among NICU nurses.

According to this theory two people, usually stranger, come together in a health organization to help or be helped to maintain a state of health. The concept includes interaction, perception, communication and transaction roles.

**Perception**

Refers to the personal representation of reality. It is universal yet highly subjective and unique to each person. Hence the Investigator’s perception is that NICU nurses may have inadequate knowledge on infection control measures in neonatal intensive care unit and prevention of nosocomial infection.

**Judgement**

The investigator judged that utilization of infection control protocol may enhance more knowledge and practice on infection control measures to be followed in the neonatal intensive care unit. The NICU nurses also judged that utilization of protocol can enhance knowledge and practice of them.

**Communication**

The investigator provided information directly regarding infection control measures to be followed in the NICU through protocol. The NICU nurse received the information and utilizes the protocol to enhance their knowledge and practice.

**Mutual Goal Setting**

The investigator and NICU nurse mutually communicated information and established goals. The investigator’s goal is to provide information on infection control measures to NICU nurses via protocol. The nurse’s goal is to utilize the protocol to upgrade their knowledge and practice.
Reaction

Investigator developed and validated the infection control protocol to enhance the knowledge and practice on infection control measures in neonatal intensive care unit. The nurses are willing to utilize the protocol which is administered for them.

Interaction

Interaction refers to the verbal and nonverbal behaviour of an individual and the environment and between two or more individual with a purpose to achieve goal. Hence, the investigator interacted with NICU nurses by administration of protocol and conducted the posttest.

Transaction

Transaction refers to reach an agreement about how to attain the goal and then set about to realize the desired goal. Hence, the investigator administered the protocol to NICU nurses and assessed the level of knowledge and practice by conducting posttest.
OUTLINE OF THE REPORT

Chapter I:  This chapter dealt with the background of the study, the need for the study, statement of the problem, objectives, operational definitions, null hypothesis, assumptions, delimitations and conceptual framework.

Chapter II: Deals with review of literature.

Chapter III: Presents the methodology of the study and plan for analysis.

Chapter IV: Focuses on data analysis.

Chapter V:  Describes the discussion of the study.

Chapter VI: Gives summary, conclusion, implication and limitation for the study as well as recommendation.

The study report ends with selected demographic variables.
CHAPTER – II

REVIEW OF LITERATURE

This chapter deals with the related literature review which aids to generate a picture of what is known and not known about a particular situation.

Review of literature is an organized critique of important scholarly literature which supports a study and a key step in research process (Polit & Hungler)\textsuperscript{22}. An extensive review of literature was done by the investigator to gain an insight into the problem, collect maximum information from systematic and critical review of scholarly publications, unpublished scholarly print materials. The logical sequence of the chapter is organized in the following sections:

Section-A: Reviews related to nosocomial Infections.
Section-B: Reviews related to knowledge of nurses on infection control Practices.
Section C: Reviews related to Practice of nurses on infection control measures.

SECTION–A: REVIEWS RELATED TO NOSOCOMIAL INFECTION

Roberts Balton et al., (2010)\textsuperscript{35} conducted a descriptive study on compliance of infection control measures theory versus practice, using Survey method in Delhi. They found that 45% of health worker did not wash their hands, 24% did not change their gloves between clients and 12% did not wear gown and mask when needed. They suggested methods for increasing effective hand washing in clinical setting and utilization of effective infection control measures.

Agarwal Meena & Thomas Punnamma., (2010)\textsuperscript{31} conducted a prospective study of 2441 clients on prevalence of post operative nosocomial infection in
neurosurgical clients and associated risk factors at AIIMS, Delhi. Post operative nosocomial infection was observed in 7.03% clients. And infection at surgical site was observed in 70% while 30% had infections at various sites. The risk factors identified were altered sensorium, elective ventilation and injudicious use of gloves. They concluded that compliance with asepsis and hand washing practice and use of close CSF drainage system and early extubation would reduce the burden of nosocomial infection in post operative neurosurgical clients.

The Centers of disease control and prevention (2010)\(^7^9\) has stated that it is well demonstrated that the most important measures for preventing the spread of pathogens is effective hand washing. In India, Hand washing is mandatory in most Health care settings and required by many different states and local regulations.

Dunbar., (2010)\(^4^1\) conducted a prospective surveillance study to describe the epidemiological profile of nosocomial infection in the PICU and NICU and its related risk factors among 257 patients admitted to the PICU and 121 patients to the NICU. In the NICU the incidence rate of nosocomial infections was 74.3% infections per 100 admissions and in the PICU 27% infections per 100 patient days. The study concluded that infection control measures should be evaluated to reduce associated morbidity.

Maki et al., (2009)\(^5^5\) conducted a Cross Sectional study on epidemiology of nosocomial infections in a PICU among 100 clients who were hospitalized. During the study period, 14.7% proved to have nosocomial infection. Mortality rate was significantly higher(40%) when compared with non nosocomial infection group(11.5%). This study concluded that long stay in PICU and less than 2 years are the main risk factors for nosocomial infection and samples with Nosocomial infection are 5.13 times likely to die.

Heley W J. et al., (2009)\(^5^0\) conducted a Observational study on hand washing compliance in a Community teaching Hospital, Israel among nurses. The
Researchers found that the overall compliance with Hand washing was 76%. 68% of health workers washed hands before patient care and 80% after client care (80%). Female complied more than males (69% versus 80%, p<0.0001) and nurses more than physicians (89% vs 69%, p<0.001) in neonatal intensive care units.

Angelilo I. F., (2009) conducted self administered survey of knowledge, beliefs and practices of NICU Health worker regarding nosocomial infections, central venous catheter and hand hygiene among 215 NICU Health care workers. They found that the 92% knew central venous catheters should be capped, clamped or connected to running fluids at all times. 95% knew when to change gloves. 31% knew the recommended duration for hand washing. Most healthcare workers believed sterile technique in CVC care (90%), gloves (91%) prevent nosocomial infection. 67% used sterile barriers to insert CVC, 76% reported wearing gloves, 81% reported routine hand washing. The study concludes that a disconnect between CVC knowledge and beliefs and practice Health care workers did not know the relationship between bacterial hand counts and rings and finger nails and did not believe rings and finger nails and did not believe rings or long nails increased the risk of Nosocomial infections.

Milward S. Barnett., (2009) conducted a descriptive survey to evaluate compliance with recommended patient care practices for the prevention of hospital acquired infections in the intensive care units among 1642 general ICUs. Study concluded that documented guidelines and one infection control nurse is strongly advocated to reduce the incidence of nosocomial infection.

Mederos E. S et al., (2008) conducted an epidemiological study, on applicability of American CDC guidelines on Surveillance system of nosocomial infection among 492 clients in Chile were followed with global nosocomial infection rate of 14% for discharged clients. The calculated sensitivity and specificity of the system was 84.2% & 97% respectively. In relation to ICU procedures, infection rate were 74% & 75% respectively. Study concluded that
infection rate is similar in Chile & USA; hence the epidemiological data collected can be useful to focus intervention as preventive strategy.

**Kim PW Roghmann M.C., (2008)** conducted an evaluative study on rate of hand disinfection associated with glove use. Hand compliance and gloves use among 125 nurses in 2 NICUs at a tertiary care Hospital in U.S.A. The nurses were observed for 40 hours and found to have 589 opportunities for hand disinfection. But overall compliance was only 22.1% which is statistically significant. Also there was positive association between glove use and subsequent hand disinfection. The study concluded that glove use increases hand disinfection and decrease nosocomial infection rates.

**Singhi S, et al., (2008)** conducted a prospective study of four infection control strategies in four wards in a large pediatric hospital in the west of Delhi. The study showed that the number of children initially Respiratory Syncytial virus negative who became RSV positive within 7 days after hospital admission. Without special precautions there was a high rate of Nosocomial RSV infection(26%). Study concludes that Infection rate was significantly reduced by the combination of cohort nursing with the wearing of gloves and gowns for each contacts.

**Kulkarni Semmelweis et al., (2008)** conducted Independent studies in Boston established a link between the hands of Healthcare worker and the spread of hospital acquired disease.

**Yolulus S., (2008)** conducted an observational study to determine frequency, pattern and etiology of nosocomial infection in Neonatal Intensive Care Unit of Tertiary Care Hospital among 333 clients. This study shows that 97 out of 333 clients acquired nosocomial infection at the frequency of Respiratory infections 30.1%, UTI 39.1% and blood stream infections 23.7%. Study concludes that proper nursing care, sterilization and disinfection of instruments and equipments and
careful handling of invasive procedures are the best tool to control these life threatening infections.

SECTION B: REVIEWS RELATED TO KNOWLEDGE OF STAFF NURSES IN INFECTION CONTROL PRACTICES

Giger H, et al., (2010)\textsuperscript{45} conducted a descriptive study on impact of teaching interventions on nurses compliance with hand disinfection among 100 nurses working in a level 3 PICU. This study shows that compliance with hand disinfection can be improved through targeted teaching and supportive structural education and their positive impact may persist even after targeted teaching activities have ended.

Clendenon W et al., (2009)\textsuperscript{37} conducted self administered survey of knowledge, beliefs and practices of NICU Health worker regarding nosocomial infections, central venous catheter and hand hygiene among 215 NICU Health care workers. They found that the 92% knew central venous catheters should be capped, clamped or connected to running fluids at all times. 95% knew when to change gloves. 31% knew the recommended duration for hand washing. Most healthcare workers believed sterile technique in CVC care (90%), gloves (91%) prevent nosocomial infection 67% used sterile barriers to insert CVC, 76% reported wearing gloves, 81% reported routine hand washing. The study concludes that a disconnect between CVC knowledge and beliefs and practice Health care workers did not know the relationship between bacterial hand counts and rings and finger nails and did not believe rings and finger nails and did not believe rings or long nails increased the risk of Nosocomial infections.

Goud et al., (2009)\textsuperscript{47} conducted a study to assess the impact of an educational interventions for promoting infection control measures among 296 nurses. The educational intervention consisted of a one hour workshop aimed at nurses with a previous questionnaire on hand washing, a presentation on three key points (hand washing, use of gloves and use of alcohol based solutions). Compliance
to hand washing ranged between 27.7% -87% and use of gloves 29%. Study concluded that training workshops had a positive impact on infection control measures, but there was no significant change in the use of gloves.

**Luke R., (2009)** conducted a quasi experimental study to examine the impact of online course on nurses and allied health professionals competency in infection prevention and control and influence of organizational climate on knowledge transfer among 16 nurses. An online course in infection control was developed to facilitate the delivery of standardized training to large number of health providers. The study concluded that this approach gives learners the opportunity to refresh infection control and prevention skills.

**Dubbert P. M et al., (2009)** conducted a study on the knowledge of disinfection practices and the behavior in operating room in order to control and prevent nosocomial infections among nursing staff at a hospital. The report suggested that it is necessary for high percent of head nurses and nurses to have guidelines for the disinfection/sterilization procedures to avoid infections. Many nursing staff don’t wear gloves and overshoes. Study concluded that it is important to have training and retraining courses on disinfection practices to improve technical knowledge and behavior.

**Ford Jones et al., (2009)** conducted a study on Health care associated infections among 250 health care workers which revealed that despite infection control policies and practices and ongoing programmes for Healthcare workers, HCAI infection rates within the NICU continue to increase. The study concluded that many more interventions must be carried out to healthcare workers to reduce increased nosocomial infections.

**Lizy C.M.Cherry., (2009)** conducted a study to assess the nurses knowledge of evidence based guidelines for the prevention of surgical site infection among 809 ICU nurses. Data collection was done using multiple choice knowledge
test. Mean score of the test was 29%. The study concluded that current guidelines should support their ongoing training and education.

**Gracia., (2009)** conducted a study to assess the impact of an educational interventions for promoting infection control measures among 296 nurses. The educational intervention consisted of a one hour workshop aimed at nurses with a previous questionnaire on hand washing, a presentation on three key points (hand washing, use of gloves and use of alcohol based solutions). Compliance to hand washing ranged between 27.7% - 87% and use of gloves 29%. Study concluded that training workshops had a positive impact on infection control measures, but there was no significant change in the use of gloves.

**Lauke R., (2009)** conducted a quasi experimental study to examine the impact of online course on nurses and allied health professionals competency in infection prevention and control and influence of organizational climate on knowledge transfer among 16 nurses. An online course in infection control was developed to facilitate the delivery of standardized training to large number of health providers. The study concluded that this approach gives learners the opportunity to refresh infection control and prevention skills.

**Shameem Fawder et al., (2009)** conducted a study on the knowledge of disinfection practices and the behavior in operating room in order to control and prevent nosocomial infections among nursing staff at a hospital. The report suggested that it is necessary for high percent of head nurses and nurses to have guidelines for the disinfection/sterilization procedures to avoid infections. Many nursing staff don’t wear gloves and overshoes. Study concluded that it is important to have training and retraining courses on disinfection practices to improve technical knowledge and behavior.

**Suchithra J.B., (2007)** conducted a quasi experimental study to assess the knowledge, attitudes and practice among the different health care workers on
nosocomial infections among 50 doctors, 50 nurses and 50 ward aides. The study showed that the compliance level to hand washing practices differed among different health care workers. Total compliance was 63.3%, 76.7% and 74.6%. Study concluded that there is a need to develop a system of continuous education for all the categories of staff to reduce the incidence of nosocomial infection, compliance with interventions are mandatory.

Zack J.E. (2007) conducted an anonymous questionnaire survey on knowledge and practices of hospital staff in infection control among 173 nursing staff and 173 medical staff caring for NICU clients. Nurses were very familiar with all written policies and procedures than medical staff. Study concludes that ways to motivate and educate to comply with infection control measures are urgently required; some degree of National standardization of policies and procedures in infection control is desirable.

Venbergh A. Geornen M, et al., (2007) conducted a surveillance of Hospital acquired infection in an Intensive Care department to find out the benefit of the full time presence of an Infection control nurses within 42 bedded ICU of a teaching hospital. They found that the creation of a full time infection control nurse post was followed by a 42% reduction in device related Hospital acquired infection rate over 3 years and 33% reduction over a period of % years. They concluded that revision of procedures and bedside teaching was key factors in the improvement of quality care.

Milward et al., (2006) conducted a descriptive study on assessment of knowledge on isolation precautions among 175 ICU staff nurses in London. The study revealed that nurses had inadequate knowledge regarding isolation precaution and they also observed that even though gloves and apron was available 93% of them kept this outside the isolation rooms. Study concluded that use of isolation precautions reduces the risk of nosocomial infections.
SECTION C: REVIEWS RELATED TO PRACTICE OF NURSES ON INFECTION CONTROL MEASURES

Roberts L., (2010) conducted a systemic review of National evidence based guidelines for preventing healthcare associated infections in National Health Service Hospitals by a Nurse led multiprofessional team of Researchers. The guidelines describes the precautions nurses should take in three standard principles of HCAI [Hand hygiene, Use of personal protective equipment and safe use and disposal of sharps; preventing infection associated with central venous catheter; and preventing infections associated with use of short term indwelling catheter]. This study concluded that periodically updating the evidence base and guideline recommendations are essential features to prevent nosocomial infections.

Cohen B, et al., (2009) conducted a study to determine whether the hand hygiene practices differ between levels of contact with neonates among 200 level I, level II and level III health personnel. Hand hygiene practices for each touch were categorized into five groups. Clean hands and new gloves, uncleaned hands and new gloves, used gloves and clean hands, clean hands and no gloves, uncleaned hands and no gloves. They found that nurses (p=0.001), attending physician (p=0.02) and physician in training (p=0.03) but only 22.8% of all touches were with cleaned as newly gloved hands. The researchers concluded that hand hygiene was suboptimal in this high risk setting.

Guha and Garg., (2009) conducted a Observational study on Hand washing compliance in a Community teaching Hospital, Israel among nurses. The Researchers found that the overall compliance with Hand washing was 76%. 68% of health workers washed hands before patient care and 80% after client care(80%). Female complied more than males(69% versus 80%,p<0.0001) and nurses more than physicians (89% vs 69%,p<0.001) in neonatal intensive care units.

Trick W.E, et al., (2009) conducted a comparative study on impact of ring wearing on hand contamination and determined risk factors for hand
contamination among surgical ICU nurses. The Researchers found that ring wearing was associated with 10 fold higher median skin organisms such as Staphylococcus aureus, Gram negative bacilli or candida species. Moreover, a stepwise increase in the risk of contamination with number of ring worn increased. They suggested ring wearing increased the frequency of hand contamination with potential nosocomial pathogens.

Colombo C et al., (2009)<sup>39</sup> performed a quasi experimental study on strategies to improve hand hygiene practices among participants in two University hospitals among 646 healthcare workers. The study used interventions as distribution of posters, leaflets, representing a hand washing slogan and a parade to boost hand hygiene practice. Study concludes that multifaceted approaches could be adapted to help improve hand hygiene practices among Healthcare workers.

Chitnis D. S, et al., (2009)<sup>35</sup> conducted a study on Educational interventions to reduce the rate of central catheter related blood stream infections in the NICU: a review of the research literature among four database-PUBMED, CINAHL, Cochrane and OVID. Study concluded that often studies that measured CR-BSI, before and after educational interventions, nine showed that a post intervention reduction in the rate of CR-BSI of 40% higher than 10<sup>th</sup> reported a reduction rate of 20%.

Sharma R. K et al., (2009)<sup>87</sup> conducted a descriptive study on neonatal nurse practitioners and their role as advanced practitioners in neonatal intensive care units among 55 PG nurses in USA. The study concluded that both professionals and families were satisfied with the neonatal practitioners clinical skills, knowledge base and their contributions to neonatal care.

Kim P.W, et al., (2008)<sup>51</sup> conducted an evaluative study on rate of hand disinfection associated with glove use among 60 nurses in 2 NICUs at a tertiary care hospital in Qatar. The nurses were observed for 40 hours and found to have
589 opportunities for hand disinfection. But the overall compliance was only 22.1% which was statistically significant. Also there was positive association between glove use and subsequent hand disinfection. The study concluded that glove uses increases compliance with hand disinfection and decreases nosocomial infection rate.

Heley W. J., (2007)\textsuperscript{50} conducted a pre experimental study on compliance of infection control measures: theory verses practice, survey method in Delhi among 100 nurses. The study revealed that 45% of the nurses did not wash their hands, 24% did not change their gloves between patient contacts and 12% did not wear gown and mask needed. The study concluded that increasing effective infection control practices reduces the risk of nosocomial infections in clinical settings.
CHAPTER – III

RESEARCH METHODOLOGY

This chapter describes the Methodology adopted in this study to assess the effectiveness of Infection control protocol on knowledge and practice among NICU nurses working at selected hospitals, Kanyakumari District.

This phase in the study includes deals the research design, variables, setting of the study, population, sample, inclusive criteria for sample selection, sample size, sampling technique, development and description of the tool, content validity, pilot study, reliability of the tool, data collection procedure and plan for data analysis.

RESEARCH DESIGN

The research design used for this study was quasi experimental non equivalent control group post test only design. Based on Polit and Hungler, (2011) the framework for the study was done as:

<table>
<thead>
<tr>
<th>Group</th>
<th>Intervention(X)</th>
<th>Post Assessment(O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>Administration of infection control protocol on to be followed in NICU in the form of lecture cum demonstration, booklet and reinforcing through video show and return demonstration.</td>
<td>Assessment of post test level of knowledge and practice regarding infection control protocol among NICU nurses using structured questionnaire and modified observational checklist based on AIIMS and WHO practical guide.</td>
</tr>
<tr>
<td>Group B</td>
<td>Hospital Routine such as admission &amp; discharge, hygienic needs, medication administration, IV fluid administration were performed.</td>
<td>Assessment of post test level of knowledge and practice regarding infection control protocol among NICU nurses using structured questionnaire and modified observational checklist based on AIIMS and WHO practical guide.</td>
</tr>
</tbody>
</table>
VARIABLES

Independent Variables
The independent variable in this study was infection Control Protocol.

Dependent Variables
The dependent variables in this study were knowledge and practice of NICU nurses regarding infection control protocol.

Extraneous Variables
The extraneous variables were age, gender, educational status, total years of experience and position held in the ward.

SETTING OF THE STUDY
The setting of the study is PPK hospital, Marthandam and Grace Hospital, Kaliakkavilai. Both hospitals are Multi Speciality hospitals with Neonatal intensive care unit. PPK hospital is a 250 bedded hospital located at Marthandam, Kanyakumari District. Grace Hospital is 250 bedded hospital located at Kaliakkavilai, Kanyakumari District.

POPULATION
Target Population
The study population consisted of NICU nurses working in the hospital setup.

Accessible Population
All registered nurses who were working in NICU at PPK Hospital and Grace Hospital.

SAMPLE
The registered nurses who satisfied the sample selection criteria were the samples of the study.
SAMPLE SIZE

It consists of 60 nurses who were working in the Neonatal intensive Care unit. Of the 60, 30 nurses were allotted to group A and 30 nurses were allotted to group B.

CRITERIA FOR SAMPLE SELECTION

Inclusive Criteria
1. Registered nurses working in Neonatal Intensive care unit.
2. Nurses working at various levels of NICU with minimum experience of above 6 months.
3. Nurses who were available during the period of the study.

Exclusive Criteria
1. Nurses who were not willing to participate in the study.
2. Nurses who had undergone training in infection control training programme.

SAMPLING TECHNIQUE

The samples were selected by Non probability convenient sampling. The investigator explained the study to the selected samples and obtained their written consent to participate in the study.

DEVELOPMENT AND DESCRIPTION OF TOOL

After an extensive review of literature, discussion with the experts and with the investigator’s personal and professional experience, a structured questionnaire was developed to assess the knowledge and an observational checklist to assess the practice of nurses utilizing the protocol on infection control measures in Neonatal Intensive Care unit.

Section A:

Consists of demographic variables which includes age, gender, educational status, total years of experience and designation in the ward.
**Section B:**

Consists of structured questionnaire, 30 questions were formulated under separate sub headings to assess the knowledge of the NICU nurses on infection control measures:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Items</th>
<th>No. of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 10</td>
<td>General information on Infection control measures</td>
<td>10</td>
</tr>
<tr>
<td>11 to 20</td>
<td>- Definition &lt;br&gt;- Causes of nosocomial infection &lt;br&gt;- Sources of infection in NICU &lt;br&gt;- Ways to minimize infection</td>
<td>10</td>
</tr>
<tr>
<td>21 to 27</td>
<td>Before entering into the neonatal intensive care unit &lt;br&gt;- Guidelines for entry into the neonatal intensive care unit &lt;br&gt;- Hand washing</td>
<td>7</td>
</tr>
<tr>
<td>28 to 30</td>
<td>Working in the neonatal intensive care unit. &lt;br&gt;- Personal protective equipments &lt;br&gt;- Aseptic precautions to be followed during procedures &lt;br&gt;- Setting of a bed</td>
<td>3</td>
</tr>
<tr>
<td>28 to 30</td>
<td>On exit from the neonatal intensive care unit.</td>
<td>3</td>
</tr>
</tbody>
</table>

**Scoring Key:**

Each item was a closed ended multiple choice questions with a single correct answer. Scoring for the correct answer was “1” and the wrong answer was “0”. Total score of the items was “30”. Maximum score was “30” and minimum score was “0”.

<table>
<thead>
<tr>
<th>Score</th>
<th>Level of Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 50%</td>
<td>Inadequate knowledge</td>
</tr>
<tr>
<td>50-75%</td>
<td>Moderately adequate knowledge</td>
</tr>
<tr>
<td>&gt; 75%</td>
<td>Adequate knowledge</td>
</tr>
</tbody>
</table>
Section C: Intervention tool

The intervention tool consists of lecture cum demonstration, booklet, video show and return demonstration regarding infection control measures;

- General Information on nosocomial infections.
- Before entering into the neonatal intensive care unit.
- Working in the neonatal intensive care unit.
- On exit from the neonatal intensive care unit.

I. Formal teaching to introduce the components of Infection control protocol among NICU nurses.

II. Administration of infection control protocol for NICU nurse:

The intervention tool consists of lecture cum demonstration, booklet, video show and return demonstration regarding:

- General Information on nosocomial infections.
- Before entering into the neonatal intensive care unit.
- Working in the neonatal intensive care unit.
- On exit from the neonatal intensive care unit.

Section D:

Post level practice was assessed using observational checklist based on AIIMS and WHO practical guide.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Items</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BEFORE ENTERING INTO THE NICU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Removing shoes, socks, watch, bangles and ring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Wearing NICU slippers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Rolling up the sleeves upto the elbow</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Washing hands with antiseptic solution and water for 3-5 minutes following six steps hand washing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Drying hands with disposal towels or air dryer</td>
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</tr>
<tr>
<td>6</td>
<td>Wearing clean outfit gown and mask</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>WORKING IN THE NICU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Using sterile use gloves during each contact with clients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Washing hands before and after every procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Following safe disposal practices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Cleaning the isolette inside and outside using chlorine (200-500 ppm) or isopropyl alcohol(70%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Maintaining 2-3 feet distance between isolettes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Using sterile water in Nebulizers and humidifiers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Instructing Visitors to follow Universal precautions before entering into the NICU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Changing Ventilator circuits once in every 7 days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Routine cleaning of all client care equipment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Maintaining strict asepsis during all invasive procedures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Having separate equipments for all children</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>ON EXIT FROM NICU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Discarding all personal protective equipment prior to exiting from the NICU</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Performing routine hand washing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Transporting the soiled linen to the laundry department</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SCORING KEY:**

<table>
<thead>
<tr>
<th>SCORE</th>
<th>LEVEL OF PRACTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;50%</td>
<td>Poor practice</td>
</tr>
<tr>
<td>51-75%</td>
<td>Fair Practice</td>
</tr>
<tr>
<td>&gt;75%</td>
<td>Good Practice</td>
</tr>
</tbody>
</table>

Total item score: 20. Maximum score was ‘20’ and minimum score was ‘0’.
CONTENT VALIDITY

The content validity of the data collection tool and intervention tool was ascertained from the expert’s opinion in the following field of expertise.

- Neonatologists – 2
- Pediatric Nursing experts – 3

Modifications were made as per the experts suggestions and incorporated in the tool. Experts suggested to maintain pair matching in selection of samples to maintain homogeneity.

ETHICAL CONSIDERATION

The ethical principles followed in the study was

I. Beneficiaries

1. Freedom from harm & discomfort

   Participants were not subjected to unnecessary risks for harm as discomfort during the study period.

2. Protection from exploitation

   Participants were assured that their participation or information they provided would not be used against them in any way.

II. Respect for human dignity

   Participants were given full rights to ask questions, refuse to give information and also to withdraw from the study.

A written consent was obtained from the participants initially for their willingness to participate in the study.

III. Justice

   The selection of study participants was completely based on research requirements. A full privacy was maintained throughout the process of data collection.
PILOT STUDY

The pilot study was conducted after obtaining ethical committee clearance from International Centre for Collaborative Research. Written formal permission was obtained from the Principal of Omayal Achi College of nursing and Honorary Secretary, PHC, West Mambalam during the month of June for a period of one week to conduct the pilot study. For Group A, the investigator selected 5 NICU nurses from PHC, West Mambalam using non probability convenient sampling and explained about the questionnaire and obtained written consent. Formal lecture cum demonstration on infection control measures in the Neonatal Intensive Care unit was given and reinforced through video show and return demonstration. After 3 days, the nurses were gathered in the conference hall and post test was administered by using structured questionnaire. Each sample took 20 min to answer the questions. Their practice was assessed by using observational checklist, which is based on modified AIIMS and WHO practical guide.

For Group B, the investigator selected 5 NICU nurses from KC Hospital, Avadi, using non probability convenient sampling method and explained about the questionnaire and obtained written consent. The nurses were gathered in the conference room and questionnaire was administered. Each sample took 20 min to answer the questions, and their practice was assessed by using observational checklist which is based on modified AIIMS & WHO Practical guide. Lecture cum demonstration on hand washing techniques was given and reinforced through video show and return demonstration for ethical purpose. Homogeneity was maintained by doing pair matching in selection of samples.

RELIABILITY OF THE TOOL

The reliability of the tool for knowledge assessment was established by test-retest method. The reliability score was “$r = 0.89$” using Karl Pearson’s correlation method. The r value indicated that there was a high positive correlation.
The reliability for practice was established by inter-rater observer method. The reliability score was “r=0.86”. The ‘r’ value indicated a high positive correlation, hence the tool was considered reliable to proceed with the main study.

PROCEDURE FOR DATA COLLECTION

A formal permission was obtained from the Principal, Omayal Achi College of Nursing and Ethical clearance was obtained from the International Centre for Collaborative Research and written permission was obtained from the Medical Superintendent, PPK Hospital and the Administrative Officer, Grace Hospital.

The Research study was conducted in the month of June. Introduction about the investigator and information regarding the nature of the study was explained to the selected samples so as to promote the full participation. The investigator obtained informed consent from the study participants and they were reassured regarding confidentiality of their scores. Privacy and confidentiality was maintained throughout the data collection process and the data was collected for a period of four weeks.

The Investigator selected 60 samples who fulfilled the selection criteria using non probability convenient sampling method. Among 60 samples, 30 samples were in the study group and 30 samples were in the control group.

Study group participants were collected in batches and were seated Conference hall. Teaching was given regarding the protocol on Infection control measures to be followed in the neonatal intensive care unit. Followed by demonstration on hand washing techniques, gowing and gloving were done. A video show on hand washing technique was shown for reinforcement. Return demonstration was also performed by the study participants.

As planned earlier the investigator conducted post test after a week. The study group participants were collected during shift change and were seated in the
conference room. The nurses were given clear explanation regarding the questionnaire. The self-administered questionnaire was given to the nurses. Each nurse took around 40 minutes to answer all questions.

Post level practice was assessed using the observational checklist for a period of 2 weeks among experimental group and control group respectively. The practice was assessed from morning 8 am to night 8 pm. Towards the end of the data collection period teaching was given for the control group participants and were administered with the protocol. During the data collection process the investigator assisted the control group participants by performing hospital routines such as admission & discharge, hygienic needs of sick newborns, nutritional needs, ventilator care, suctioning, assisted the physician in ET intubation, medication administration, IV fluid administration for ethical considerations.

**PLAN FOR DATA ANALYSIS**

**Descriptive Statistics**

1. Frequency and percentage distribution were used to analyze demographic variables of nurses.
2. Mean and standard deviation were used to assess the post intervention level of knowledge and practice among NICU nurses in group A and group B.

**Inferential Statistics**

1. Unpaired t test was used to assess the effectiveness of infection control protocol among NICU nurses in group A and group B.
2. Correlation co-efficient was used to find out the relationship between knowledge and practice among NICU nurses in group A and group B.
3. Chi Square was used to find out the association of post intervention level of knowledge and practice with selected demographic variables.
CHAPTER – IV

DATA ANALYSIS AND INTERPRETATION

This chapter deals with the analysis and interpretation of data collected from 60 NICU nurses working in Grace Hospital and PPK Hospital to assess the effectiveness of infection control protocol. Statistical analysis is a method for rendering quantitative information meaningful and tangible. This enables the researcher to summarize, organize, evaluate, interpret and communicate numeric information.

The data collected for the study was grouped and analysed as per the objectives set for the study. Data analysis includes both descriptive and inferential statistics.

ORGANISATION OF DATA

The data has been grouped, tabulated and organized below as follows:

SECTION A: Description of the demographic variables of NICU nurses.
SECTION B: Assessment of the post intervention level of knowledge and practice on infection control measures among the NICU nurses in the group A and group B.
SECTION C: Assessment of effectiveness of protocol on level of knowledge and practice among the NICU nurses.
SECTION E: Correlation between the post intervention level of knowledge and practice score in the group A and group B.
SECTION F: Association of post intervention level of knowledge and practice of NICU nurses with selected demographic variables in the group A and group B.
SECTION A: DESCRIPTION OF THE DEMOGRAPHIC VARIABLES OF NICU NURSES.

Table 1.a. : Frequency and percentage distribution of demographic variables of the NICU nurses in the group A and group B with respect to age in years, gender and education.

<table>
<thead>
<tr>
<th>Demographic Variables</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Age in years</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 - 25</td>
<td>15</td>
<td>50.00</td>
</tr>
<tr>
<td>26 - 30</td>
<td>8</td>
<td>26.67</td>
</tr>
<tr>
<td>31 - 35</td>
<td>5</td>
<td>16.67</td>
</tr>
<tr>
<td>&gt;36</td>
<td>2</td>
<td>6.67</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3</td>
<td>10.00</td>
</tr>
<tr>
<td>Female</td>
<td>27</td>
<td>90.00</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma in Nursing</td>
<td>14</td>
<td>46.67</td>
</tr>
<tr>
<td>Post Basic B.Sc(N)</td>
<td>14</td>
<td>46.67</td>
</tr>
<tr>
<td>B.Sc.(N)</td>
<td>2</td>
<td>6.67</td>
</tr>
</tbody>
</table>

Table 1(a) describes the frequency and percentage distribution of demographic variables of the NICU nurses in group A and group B with respect to age in years, gender and education.

With regard to age in years majority 15(50%) of the nurses belongs to age group of 20 – 25 years and 27(90%) belongs to females both in group A and group B.

With regard to group A, majority 14(46.67%) of the nurses had done Diploma in Nursing and Post Basic B.Sc(N) whereas in the group B majority 18(60%) had done Diploma in nursing.
Table 1.b. : Frequency and percentage distribution of demographic variables of the NICU nurses in the group A and group B with years of experience and designation in the ward.

N = 60

<table>
<thead>
<tr>
<th>Demographic Variables</th>
<th>Group A</th>
<th></th>
<th>Group B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td><strong>Years of Experience</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 - 2</td>
<td>15</td>
<td>50.00</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>3 - 5</td>
<td>8</td>
<td>26.67</td>
<td>8</td>
<td>26.67</td>
</tr>
<tr>
<td>5 - 10</td>
<td>5</td>
<td>16.67</td>
<td>5</td>
<td>16.67</td>
</tr>
<tr>
<td>&gt;10</td>
<td>2</td>
<td>6.67</td>
<td>2</td>
<td>6.67</td>
</tr>
<tr>
<td><strong>Designation in the ward</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff Nurse</td>
<td>23</td>
<td>76.67</td>
<td>23</td>
<td>76.67</td>
</tr>
<tr>
<td>Senior Nurse</td>
<td>4</td>
<td>13.33</td>
<td>4</td>
<td>13.33</td>
</tr>
<tr>
<td>Nurse Incharge</td>
<td>3</td>
<td>10.00</td>
<td>3</td>
<td>10.00</td>
</tr>
</tbody>
</table>

Table 1(b) describes the frequency and percentage distribution of demographic variables of the NICU nurses in group A and group B with respect to years of experience and designation in the ward.

With regard to years of experience, majority 15(50%) of the nurses have 1-2 years of experience and 23(76.67%) of were having the designation of nurses both in group A and group B.
SECTION B: ASSESSMENT OF THE POST INTERVENTION LEVEL OF KNOWLEDGE AND PRACTICE ON INFECTION CONTROL MEASURES AMONG NICU NURSES IN GROUP A AND GROUP B.

Table 2: Frequency and percentage distribution of post intervention level of knowledge on infection control measures in group A and group B.

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Inadequate</th>
<th>Moderately Adequate</th>
<th>Adequate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group A</td>
<td>Group B</td>
<td>Group A</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>General Information</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Before entering into NICU</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Working in the NICU</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>On exit from NICU</td>
<td>0</td>
<td>0</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 2 depicts the frequency and percentage distribution of post intervention level of knowledge on infection control measures in group A and group B.

With regard to the group A, 30(100%) had adequate knowledge on general information, majority 29(96.67%) had adequate knowledge on before entering into NICU, 26(86.67%) had adequate knowledge on working in the NICU and 28(93.33%) had adequate knowledge on exit from NICU.

With respect to group B, 25(83.33%) had moderately adequate knowledge on general information, 23(76.67%) had moderately adequate knowledge on before entering into NICU, 26(86.67%) had moderately adequate knowledge on working in the NICU and 12(40%) had adequate knowledge on exit from NICU.
The findings reveals that the administration of protocol has enhanced the level of knowledge among NICU nurses in group A than group B.
Fig. 2: Percentage distribution of overall post intervention level of knowledge in group A and group B.

Figure 1 depicts the percentage distribution of post intervention level of knowledge in group A and group B.

With regard to group A, 30(100%) of nurses were having adequate knowledge on infection control measures. In group B 30(100%) of nurses were having moderately adequate knowledge on infection control measures.

On assessment of overall post intervention level of knowledge in group A and group B depicts that there was significant improvement in the overall post intervention level of knowledge in group A than in group B. Hence the infection control protocol was found to be effective in enhancing the knowledge of NICU nurses on infection control measures.
With regard to group A, 30(100%) of nurses were having good practice on infection control measures in the NICU. In group B, 30(100%) of nurses were having fair practice on infection control measures in NICU.

On assessment of overall post intervention level of practice in group A and group B depicts that there was significant improvement in the overall post intervention level of practice in group A than in group B. Hence the infection control protocol was found to be effective in enhancing the practice of NICU nurses on infection control measures.
SECTION C: EFFECTIVENESS OF INFECTION CONTROL PROTOCOL ON KNOWLEDGE AND PRACTICE AMONG NICU NURSES.

Table 4: Comparison of post intervention level of knowledge on infection control measures between group A and group B.

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>Mean</th>
<th>S.D</th>
<th>Unpaired ‘t’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>28.03</td>
<td>1.29</td>
<td>t = 31.227*** (S)</td>
</tr>
<tr>
<td>Group B</td>
<td>17.70</td>
<td>1.26</td>
<td>p=0.000 (S)</td>
</tr>
</tbody>
</table>

***p<0.001, S – Significant

Table 4 describes the comparison of post intervention level of knowledge on infection control measures NICU nurses between the group A and group B.

With regard to group A the post test mean score was 28.03 with S.D 1.29 and in group B the post test mean score was 17.70 with S.D 1.26. The calculated’ value of 31.227 was statistically highly significant at p<0.001.

Comparison of post intervention level of knowledge on infection control measures in group A and group B depicts that there was significant improvement in the level of knowledge among nurses in group A than group B. Hence the protocol given to the NICU nurses had significantly improved their knowledge on infection control measures in group A than group B.
Table 5: Comparison of post test practice on infection control measures between group A and group B.

N = 60

<table>
<thead>
<tr>
<th>Practice</th>
<th>Mean</th>
<th>S.D</th>
<th>Unpaired ‘t’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>17.63</td>
<td>0.89</td>
<td>t = 24.662*** (S)</td>
</tr>
<tr>
<td>Group B</td>
<td>11.97</td>
<td>0.89</td>
<td>p = 0.000 (S)</td>
</tr>
</tbody>
</table>

***p<0.001, S – Significant

Table 4 describes the comparison of post intervention level of practice on infection control measures among NICU nurses between group A and group B.

With regard to group A the post test mean score was 17.63 with S.D 0.89 and in the group B the post test mean score was 11.97 with S.D 0.89. The calculated’ value of 24.662 was statistically highly significant at p<0.001.

Comparison of post intervention level of practice on infection control measures in group A and group B depicts that there was significant improvement in the level of practice among nurses in group A than group B. Hence the protocol given to the NICU nurses had significantly improved their practice on infection control measures in group A than group B.
SECTION E : CORRELATION BETWEEN THE POST INTERVENTION LEVEL OF KNOWLEDGE WITH PRACTICE IN GROUP A AND GROUP B.

Table 6 : Correlation between the post intervention level of knowledge and practice on infection control measures among NICU nurses in group A.

\[ n = 30 \]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>S.D</th>
<th>‘r’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>28.03</td>
<td>1.29</td>
<td>( r = 0.548^{**}(S) )</td>
</tr>
<tr>
<td>Practice</td>
<td>17.63</td>
<td>0.89</td>
<td>( p=0.002(S) )</td>
</tr>
</tbody>
</table>

**p<0.001, S – Significant

Table 6 describes correlation between the post intervention level of knowledge and practice on infection control measures among NICU nurses in group A.

With regard to group A, the post test mean knowledge score was 28.03 with S.D 1.29 and the post test mean practice score was 17.63 with S.D 0.89. The calculated ‘r’ value of 0.548 shows a high positive correlation between knowledge and practice which was statistically significant at p<0.001 level.

While correlating the post intervention level of knowledge and practice score in group A, it showed a high positive correlation. Hence as the knowledge of nurses on infection control measures increases their practice level also increases.
Table 7: Correlation between the post intervention level of knowledge with practice on infection control measures among NICU nurses in group B.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>S.D</th>
<th>‘r’ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>17.70</td>
<td>1.26</td>
<td>r = 0.040</td>
</tr>
<tr>
<td>Practice</td>
<td>11.97</td>
<td>0.89</td>
<td>(N.S)</td>
</tr>
</tbody>
</table>

N.S – Not Significant

Table 7 depicts correlation between the post intervention level of knowledge and practice on infection control measures among NICU nurses in group B.

With regard to group B the post test mean knowledge score was 17.70 with S.D 1.26 and the post test mean practice score was 11.97 with S.D 0.89. The calculated ‘r’ value of 0.040 shows poor correlation between knowledge and practice on infection control measures among nurses which was not statistically significant at any level.

Correlation between the post intervention level of knowledge and practice on infection control measures among NICU nurses in group B depicts poor correlation between knowledge and practice. Hence as the knowledge decreases practice level also decreases.
SECTION F: ASSOCIATION OF POST TEST LEVEL OF KNOWLEDGE AND PRACTICE OF NICU NURSES WITH SELECTED DEMOGRAPHIC VARIABLES IN GROUP A AND GROUP B.

On association of post intervention level of knowledge and practice on NICU nurses with selected demographic variables in group A and group B none of the demographic variables had shown any statistically significant association with the post test level of practice on infection control measures among staff nurses in the control group. If the study was done on large number of samples association could have been established.
CHAPTER – V

DISCUSSION

This chapter discusses the findings of the study derived from the statistical analysis and its pertinence to the objectives set for the study and related literature of the study. The purpose of the study was to assess the effectiveness of infection control protocol on knowledge and practice among NICU nurses working at selected hospitals, Kanyakumari District.

The first objective was to assess the post intervention level of knowledge and practice on infection control measures among NICU nurses in group A and group B.

On assessment of the post intervention level of knowledge on infection control measures in the NICU revealed that, in group A almost all 100% had adequate knowledge whereas in group B almost all 100% had moderately adequate knowledge on infection control measures.

The analysis on post intervention level of practice on infection control measures revealed that, in group A, majority 30(100%) had good practice level on infection control measures whereas in group B majority 30(100%) had fair level of practice on infection control measures.

The above data findings were consistent with the study conducted by Angelillo.B, et al., (2006) at Chandigarh, examined the barrier techniques used by NICU staff nurses and also evaluated the knowledge, attitude and behavior of nursing staff with infection control. Almost all (78%) were aware that improper practice increases the risk of nosocomial infection in patients. But only 38% routinely used all barrier techniques (gloves, gown, and masks).
Hence the hypothesis stated earlier that “There is no significant difference between the post intervention level of knowledge and practice on infection control measures among NICU nurses in the group A and group B at p<0.001” was rejected.

The second objective was to compare the post intervention level of knowledge and practice on infection control measures among NICU nurses between group A and group B.

Comparison of post intervention knowledge between group A and group B revealed that in group A the post test mean score was 28.03 with S.D 1.29 and in group B the post test mean score was 17.70 with S.D 1.26. The calculated ‘t’ value of 31.227 was statistically highly significant at p<0.001 which clearly indicates that the protocol given to the staff nurses had significantly their knowledge on infection control measures in group A than group B.

The post intervention level of practice between group A and group B revealed that in group A the post test mean score was 17.63 with S.D 0.89 and in group B the post test mean score was 11.97 with S.D 0.89. The calculated ‘t’ value of 24.662 was statistically highly significant at p<0.001 which clearly indicates that the protocol given to the nurses had significantly improved their practice level on infection control measures in group A than group B.

These findings are similar to the study done by Kim P.W., Ragesh M., etal (2009) who conducted an evaluative study on rate of hand infection associated with glove use among 60 nurses in 2 NICUs at a tertiary hospital. The nurses were observed for 40 hours and found to have 589 opportunities for hand disinfection. The overall compliance was only 22.1% which is statistically significant. The study concluded that glove use increases compliance with hand disinfection and decreases nosocomial infection.
The third objective was to correlate the level of knowledge with practice on infection control measures among NICU nurses in group A and group B.

The correlation between the post intervention level of knowledge and practice score in group A revealed that the post test mean knowledge score was 28.03 with S.D 1.29 and the post test mean practice score was 17.63 with S.D 0.89. The calculated ‘r’ value of 0.548 shows a positive correlation between knowledge and practice which was statistically significant at p<0.001 level. This shows that when the knowledge of nurses on infection control measures increases their practice level also increases.

The correlation between the post test level of knowledge and practice score in group B revealed that the post test mean knowledge score was 17.70 with S.D 1.26 and the post test mean practice score was 11.97 with S.D 0.89. The calculated ‘r’ value of 0.040 shows poor correlation between knowledge and practice on infection control measures among nurses which was not statistically significant at any level.

The above data findings were consistent with the study conducted by Sharir. R (2009) who concluded that nurses who received educational classes had high compliance (80%) with infection control practices.

The findings of the study were also consistent with study conducted by Orett F. (2007). The findings revealed that the effort by the infection control team through seminars, lectures, and newsletters showed improvement in attitude and awareness of staff nurses to infection control measures within the institution.

Hence the null hypothesis NH2 stated earlier that “There is no significant correlation between the post test level of knowledge with practice regarding protocol on infection control measures among NICU nurses in group A and group B at p<0.001.” was rejected.
The fourth objective of the study was to associate the knowledge and practice scores on infection control measures among NICU nurses with selected demographic variables in group A and group B.

The association between the demographic variables and knowledge and practice score was done using chi square test and the finding revealed that (table 8, 9, 10, 11) there is no association between the selected demographic variables and the knowledge and practice scores in group A and group B.

Hence the null hypothesis NH3 stated there is no significant association between post test level of knowledge and practice scores on infection control measures among NICU nurses with selected demographic variables in group A and group B was accepted.
CHAPTER –VI

SUMMARY, CONCLUSION, IMPLICATIONS, RECOMMENDATIONS AND LIMITATIONS

SUMMARY

Hospitalization can be a serious threat to the young life, due to unfamiliar situations, painful procedures and separation of family. The study in the hospital can be prolonged for various reasons; the most common reason is getting infection from hospital itself. Hospital acquired infections are preventable by health care professionals. Hence, nurses who provide care to the children in specialized units like NICU, PICU and surgical ICUs should have adequate knowledge to provide need based quality and competent care. The nurses need to have updated knowledge regarding infection control measures. Hence, the investigator wished to assess the knowledge and practice of NICU nurses regarding infection control measures.

The Objectives of the study were

1. To assess the post intervention level of knowledge and practice on infection control protocol among NICU nurses in group A and group B.
2. To compare the post intervention level of knowledge and practice on infection control protocol among NICU nurses between group A and group B.
3. To correlate the level of knowledge with level of practice on infection control protocol among NICU nurses in group A and group B.
4. To associate the knowledge and practice scores on infection control protocol with selected demographic variables of NICU nurses in group A and group B.
The study was based on the assumptions that

1. Nurses may have some knowledge and practice on Infection control measures.
2. Imparting information regarding Infection control protocol may enhance level of knowledge and practice among staff nurses.
3. Adequate information regarding infection control protocol may help to prevent the risk of nosocomial infection in the neonatal intensive care unit.

The Null hypotheses formulated were

NH₁: There is no significant difference between the post intervention level of knowledge and practice regarding infection control protocol among NICU nurses in group A and group B at p<0.001.

NH₂: There is no significant correlation between the post intervention level of knowledge with practice regarding infection control protocol among NICU nurses in group A and group B at p<0.001.

NH₃: There is no significant association between the post intervention level of knowledge and practice regarding infection control protocol among NICU nurses with the selected demographic variables in group A and group B at p<0.001.

The review of literature was derived from the primary and secondary sources that formed the basis for selection of the problem, formation of tool and conceptual framework was based on Imogene King’s Goal Attainment theory which includes interaction, perception, communication and transaction roles.

Research design used in this study was quasi experimental non equivalent control group post test only design. The study was conducted among NICU nurses. The sample size was 60 NICU nurses, 30 in group A and 30 in group B who were selected by non-probability convenient sampling technique.
The medical and nursing experts validated the tool. The pilot study was conducted in PHC, West Mambalam and K.C. Hospital, Avadi. Pilot study was conducted among 10 NICU nurses, 5 nurses in group A and 5 nurses in group B. The reliability of the tool was established by test retest method for structured questionnaire “r” =0.89 and inter rater method for observational checklist “r”=0.86 using Karl Pearson method of correlation. The pilot study was found to be practicable, and feasible to proceed with main study. The findings showed that the tool was highly reliable to proceed with the main study.

The ethical aspect of research was maintained throughout the study by getting formal permission from the respective authorities, International Centre for collaborative Research ethical committee clearance certificate and consent from participants in the study. The information collected from participants was kept confidential and it was used only for the research purpose.

The findings of the study were

The data collected was analyzed using descriptive and inferential statistics. Interpretation and discussion was done based on objectives of the study, null hypothesis, conceptual framework and research studies from literature reviews.

The overall post test mean score of knowledge in group A was 28.03 with S.D of 1.29 and the overall post test mean score of knowledge in group B was 17.70 with S.D of 1.26. The overall post test mean score of practice in group A was 17.63 with S.D of 0.89 and the overall post test mean score of practice in group B was 11.97 with S.D of 0.89. The administration of infection control protocol has increased the post test level of knowledge and practice of NICU nurses in the group A when compared with that of the group B at p<0.001. Hence the NH₁ stated earlier was rejected.

The post test level of knowledge mean score was 28.03 with SD of 1.29 in group A and the post level of practice shows mean score of 17.63 with SD of 0.89.
The calculated Karl Pearson ‘r’ value was 0.548, which shows high correlation between the post test level of knowledge and post test level of practice of the nurses in group A at p<0.001.

The post test level of knowledge of NICU nurses in group A shows that the mean score was 17.70 with SD of 1.26 and the post test level of practice shows mean score of 11.97 with SD of 0.89. The calculated Karl Pearson ‘r’ value was 0.040, which shows moderate correlation between the post test level of knowledge with post test level of practice of the NICU nurses in group B at p<0.001. Hence the NH₂ stated earlier was rejected.

There was no significant association between the post intervention level of knowledge and practice regarding infection control protocol with the selected demographic variables of the NICU nurses at p < 0.001. Hence the NH₃ stated earlier was accepted.

CONCLUSION

The present study aimed to assess the effectiveness of infection control protocol on knowledge and practice among NICU nurses working at selected hospital. The findings of the data analysis revealed that the protocol have an effect on enhancing the knowledge and practice among nurses. Hence, the infection control protocol in NICU can be utilized by nurses to prevent the risk of nosocomial infection among neonates.

IMPLICATIONS

The finding of this study elicits the implications on nursing practice, nursing education, nursing administration and nursing research.
**Nursing Practice**

Nurses working in specialized areas should have the commitment of attending any form of education programme to provide quality nursing care and update their knowledge. Nurses needs to have a thorough knowledge on various aspects of infection control measures such as sources of infection, routes of infection, high risk clients and ways to prevent the risk of hospital acquired infection. They can update their knowledge by attending continuing education programme and in-service education programme regarding infection control measures in the critical care unit.

Demonstration of medical and surgical asepsis to all staff nurses working in the critical care unit and adequate supervision, instruction and evaluation of staff nurses while rendering nursing care in critical care units which will improve infection control practices. Continue emphasize on infection control policies and frequent surveillance must be ensured to bring down the infection rate.

**Nursing Education**

Nurses, before utilizing the practices, they need to have a strong foundation in terms of education. An awareness need to be created among nursing students regarding the importance of infection control practices in critical and provision of care thereby preventing complications.

Teaching strategies such as demonstration, videoshows, procedure manuals and computer assisted interventions to train the student nurses regarding NICU setting and infection control strategies can be incorporated in the curriculum. There must be adequate supervision instruction and evaluation when student nurses are posted in the NICU settings which will enhance their knowledge and skill.

**Nursing Administration**

Staff development programme in any organization is the prime responsibility of the administrator. In the event of development of various pediatric
specialties, increasing social demands and improved medical technology puts a challenge for the nurses to demonstrate their professional and personal growth.

To update and reinforce their knowledge and continuing nursing education department in the hospital should be established to conduct regular in-service education programme to nurses who are working in NICU.

The nurse administrator must assume the responsibility of equipping the specialized unit like NICU and PICU with currently available literature, procedures, manuals, journals and textbooks on various aspects of infection control measures to reduce the risk of hospital acquired infection.

Nurse administrator also needs to take the responsibility of conducting periodic staff appraisal in these units to assess the needs and improvement in the care provided by the staff nurses.

**Nursing Research**

There is a need for extensive and intensive research in this area, so as the loop holes could be detected and thus the services could be improved. The nurses are expected to provide evidence based care. In India, the research studies in relation to the knowledge and practice of staff nurses on infection control measures are limited. Nurse researchers must be encouraged in NICU settings. Student researchers are also can be motivated to conduct studies in this area. Further the same study could be replicated with more numbers of samples for better generalization.

**RECOMMENDATIONS**

1. The researcher has encouraged the use of protocol on Infection control measures in PPK Hospital and Grace Hospital.
2. The researcher has recommended the utilization of protocol by the students of Omayal Achi College of Nursing and nurses of their affiliated institution.

3. The researcher has recommended using the protocol to update the knowledge of staff nurses in the NICU settings.

4. In future the hospital nursing administration staff can utilize the protocol to strengthen the neonatal care services to prevent nosocomial infections.

**LIMITATIONS**

1. The researcher found it very difficult to get permission from various hospitals, to conduct the pilot study and main study.

2. The investigator found difficulty to gather staff nurses at a time to conduct post test.

3. The study is limited to the nurses who are working in the NICU.

4. Researcher found difficulty in getting Indian reviews related to nursing protocols on central line care protocol.
BOOKS:


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76. Willis Jenin. (2010). Intravenous therapy, an expanding role with Implications for Education. *Nursing Times*, 95(25), 48-49.


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80. ICMR Report.
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82. AIIMS Module.

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