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"Complementary Nursing Issues and Updates in 2015"

STIKES Hang Tuah Surabaya

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Complementary Nursing Issue and Updates in 2015

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THE EFFECTIVITY OF BUBBLE CONTINUOUS POSITIVE AIRWAY PRESSURE (CPAP) AMONG NEONATES WITH SEVERE RESPIRATORY DISTRESS SYNDROME (RDS) IN Dr.RAMELAN NAVY HOSPITAL SURABAYA

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ABSTRACT

Respiratory distress was major problem in the first day of life the newborn. The severity of respiratory distress can be measured with down score for neonates. Bubble CPAP was used to help RDS among newborn. The aim of this research was to identify the efectivity of Bubble CPAP among neonates with severe RDS. This research was use pre-experiment with one group pre test post test design. The population were all of the neonates with severe RDS in Neonates Intensive Care Unit (NICU) Dr.Ramelan Navy Hospital Surabaya. The samples are 17 respondents taken by consecutive sampling technique. Instrument was observation sheet of down score. The results of wilxocon sign rank test, showed ρ = 0.000. Its means Bubble CPAP was effective to reduced RDS among neonates Bubble CPAP was effective to help newborn with severe RDS. It is show decreased score in measurement after using Bubble CPAP. It was recommended to use bubble CPAP for RDS newborn treatment.

Keyword : Bubble CPAP, down score, RDS.

Introduction

Respiratory distress is a most problem in the first days of life the newborn. Respiratory distress characterized by tachypnea, nasal flaring, intercostal retractions, cyanosis and apnea (Sholeh, 2010: 126). The period after birth is the transition phase of the newborn from intrauterine to extrauterine environment. In this phase changes infant respiratory organs. During the fetus in the uterus using a placenta for respiratory function, while the change occurs at birth transition phase in which the lungs are the main organs of respiration of the baby. Breathing disorders are the most frequent RDS (Respiratory Distress Syndrome) or HMD (hyaline membrane disease). Neonatal respiratory failure is a serious clinical problem, which is associated with high morbidity, mortality and cost of care and are categorized as high-risk infants (Surasmi et al, 2003). At the hospital the severity of respiratory distress was measured with down scores. Bubble CPAP is currently used in neonates who suffered severe respiratory distress. This study aimed to evaluate the effectiveness of Bubble CPAP to changes in the value of the down score.

The target of MDG (Millennium Development Goals) 2015 is a decrease of child mortality and improvement of maternal health. The neonatal mortality rate in Indonesia is the highest, it compared to other ASEAN countries, with a relative decline very slowly according to a survey from 2002 to 2003 (Indrasanto, Dharmasetiawani, Rohsiswatmo, Kaban, 2008). Incident of birth rate in South Asia 22%, while in Indonesia 29%. In Indonesia, one third of infant deaths occur in the first month after birth, and 80% of which occur in the first week of the main causes of death include acute respiratory infections and child perinatal complications. Respiratory distress syndroma (RDS) obtained approximately 5-10% in preterm infants, 50% in infants weighing <1500 grams (Lemons et al, 2001).

Many factor affected respiratory distress of the newborn. The history of labor process that affects the respiratory distress in neonates. A state of lack of oxygen which occurs in a relatively long period of time and acidosis worsens and decrease blood flow to the brain, there will be damage to the brain and other organs. Furthermore, respiratory depression may occur manifested by apnea are elongated and can even cause death (Wiknyosastro, 2005). The main risk factors for respiratory failure in neonates are prematurity, low birth weight babies, and also frequently occurs in infants born to mothers who suffer from uterine blood perfusion disorders during pregnancy, for example, a mother suffering from diabetes, hypertension, hypotension, cesarean section and antepartum haemorrhage (surasmi, et al). In the event of rapid respiratory rate, presence of chest retraction, cyanosis and weakened heart rate, oxygen desaturation is the result of hypoxia will get worse if it is not immediately performed perfect handling so that the purpose of the actions taken in order to survive.

Literature review

Neonatal respiratory distress is a set of symptoms consisting of hyperpnea dyspnea or respiratory frequency greater than 60x / min, cyanosis, grunting and retraction epigastric region, suprosternal, intercostal during inspiration (Ngatisyah, 2005: 23). The term used for neonatal respiratory dysfunction. This disorder is a disease associated with the development of lung maturity. (Surasmi, Asrining, et al., 2003: 70).

Respiratory distress can be classified based on the pathophysiological mechanisms that lead to hypoxemia or hypercarbia. The severity of respiratory distress measured by down score.

Table 2.1. The classification of respiratory distress based on down score

Test	Score 0	Score 1	Score 2
Respiratory rate	< 60/ minutes	60-80/ minutes	>80/ minutes
Retraction	No retraction	Mild retraction	Severe retraction
Cyanosis	No cyanosis	Cyanosis releaved by O_2	Cyanosis on O_2
Air entry	Good bilateral air entry	Mild decrease in air entry	No air entry
Grunting	No grunting	Audible by stethoscope	Audible by ear
Evaluatio			

n of total score	Diagnosis
<4	No respiratory distress
4-6	Respiratory distress
≥ 6	Severe respiratory distress, impending respiratory failure, blood gases requires

Etiology of respiratory distress divided into:

1. Obstruction of the upper respiratory tract (esophageal atresia, koanal atresia)
   a. Nasal or nasopharyngeal: koane obstruction, nasal edema, encephalocele.
   b. Oral cavity: makroglosi and mikrognati
   c. Neck: stuma congenital and cystic higroma
   d. Larynx: laryngeal web, subglotik stenosis, hemangioma, spinal cord paralysis and laringomalasia
2. Trachea: trakheomalasia, trakheoesofagus fistula, stenosis of the trachea and bronchial stenosis
3. Abnormalities of lung parenchyma
   a. Hyaline membrane disease or RDS
   b. Aspiration of meconeal, blood or milk.
   c. Ateletaksis
   d. Air leakage: pnemothoraks, pnemomesdiatinum, pulmonary interstitial emphysema
   e. TTN (transient tachypnea of the newborn)
   f. Pneumonia, hemorrhagic pneumonia
   g. Congenital abnormalities: diaphragmatic hernia, intrathoracic cyst or tumor, agenesia or pulmonary hypoplasia, congenital lobar emphysema
   h. Effusion.
4. The non pulmonary causes: every situation that causes blood flow to the lungs is increased or decreased, causing the increase in oxygen demand increased and decreased number of red blood cells causes respiratory distress
   a. Congestive heart failure
   b. Cause metabolic acidosis, hypoglycemia, hypocalcemia
   c. Pulmonary hypertension settled
   d. Neonatal depression
   e. Shock
   f. Polycythemia: the number of red blood cells that causes excessive increase in blood viscosity and prevents red blood cells easily fit into the pulmonary capillaries
   g. Hypothermia
   h. Babies with mothers with diabetes mellitus
   i. Central nervous system bleeding.

Common respiratory distress in neonates are:

A. Transient tachypnea of the newborn (TTN).

   TTN is respiratory disstress in neonates aterm in early time after birth. This happens when the baby failed to clear the airway of the lung fluid, mucus or have excess fluid in the lungs due to aspiration.

   1. Respiratory distress syndrome / RDS
   2. Apnea
   3. Meconeal aspiration syndrome
   4. Pneumonia

B. Bubble CPAP (continuous positive airway pressure)

Bubble CPAP is tool to maintain a positive pressure in the

airways during spontaneous breathing neonates (PONEK, 2008).

Bubble CPAP have 3 components :

1. A circuit that transports gas continuously for inhaled by the baby. A source of pressurized air to produce oxygen and inhaled gas. A mixing of oxygen enables the provision of appropriate FIO2 given. A flow meter control the continuous flow rate of the gas is inhaled (usually maintained at a speed of 5-7 L / min). A humidifier to warm and humidify inhaled gases.
2. A tool for connecting a circuit to the neonatal airway. The nasal prongs is the preferred method.
3. A tool for generating positive pressure on the tool sirkuit.Tekanan positive in the circuit can be achieved by inserting a pipe expiratory distal portion in 0:25% acetic acid solution until the expected depth (5 cm) or CPAP valve.

Good CPAP have characteristics :

1. Hose flexible and lightweight which enables neonates to change his position easily.
2. Easy to be installed and removed.
3. The low resistance so that the neonate can breathe spontaneously.
4. Relatively non invasive
5. Simple and easily understood by all users.
6. Cost effective and safe.

Physiological impact of CPAP to body :

1. Preventing the collapse of the alveoli and atelectasis.
2. Improve and increase the functional residual capacity (FRC) and lung oxygenation.
3. Improving compliance / pulmonary flower power.
4. Maintaining production / surfactant function.
5. Maintain airway and diaphragm.
6. Stimulates the growth of lung.
7. Provide suitability better ventilation perfusion by lowering intrapulmonar shunt.
8. Reduce excessive breathing effort.

Type of respiratory distress that can be treated by Bubble CPAP :

1. Premature neonates with RDS / HMD
2. Neonates with TTN (transient tachypnea of the newborn).
3. Neonates with MAS (meconium aspiration syndrome).
4. Neonates with apnea and bradycardia of prematurity.
5. Neonates with paralysis / paralysis of the diaphragm.
6. Neonates who had been separated from the mechanical ventilator.
7. Neonates with airway diseases such as trakeomalacia and bronchiolitis.
8. Neonatal postoperative abdominal or chest.

Methodology

The design used in this study with the methods of pre-experiment with methods one group pretest posttest, this design is also no comparison group (control) but at least we have made the first observation which allows researchers can examine the changes that occurred after the experiment.

This research was conducted in December 2012 to January 2013 in the NICU Dr.Ramelan Navy

Hospital Surabaya. The population in this study were all of neonates who had severe respiratory distress and being treated in the NICU Dr.Ramelan Navy Hospital Surabaya. Total population over the last 3 months is 30 newborn, so that in two months an average of 15 babies.

Criteria for inclusion in the study were includes premature neonates with RDS or HMD, neonates with an indication of the use of Bubble CPAP and neonates with apnea. Meanwhile, exclusion criteria in this study are neonates with comorbidities or respiratory disorders such as congenital heart disease, enchephalocelle naso, koana atresia and neonates who died with a treatment duration <5 days.

The sampling technique used in this study with consecutive sampling is sampling technique to assign subjects who met the study criteria included in the study until a certain time, so that the required number of clients are met.

The independent variable in this study is the effectiveness of the use of Bubble CPAP among neonates with severe respiratory distress in the NICU Dr. Ramelan Navy Hospital Surabaya. The dependent variable in this research is down score.

The instrument used in this study is the observation or checklist. Measurement of down score use this criteria :

a. Assessment of clinical conditions if mild respiratory distress with scoring ≤ 3 as below:
1. Respiration within normal limits 40-60 times per minute.
2. Heart rate in the normal range, normal heart rate of 120-160 beats per minute.
3. There is no retraction of the chest.
4. Increased oxygen saturation> 96%.
5. Your baby's crying is not normal moan
6. The color of the skin and lips no cyanosis.

b. Assessment of clinical conditions if respiratory distress was the scoring of 4-5 are below:
1. Respiration increases> 60x / min.
2. Heart rate weakened
3. a clear chest retraction.
4. Baby whimpers
5. The color of the skin and lips still cyanosis
6. oxygen desaturation

c. Assessment of clinical conditions if severe respiratory distress with scoring ≥ 6 are below:
1. Respiration increases> 80x / min
2. Cyanosis settled although given oxygen
3. moaning can be heard without tools
4. severe retraction
5. oxygen desaturation

Result

The result showed the characteristics of respondents which include gestational age, sex, birth weight, type of labor process, gestational age, and Apgar score values are treated in the NICU Dr.Ramelan Navy Hospital Surabaya with a sample of 17 respondents neonatus.

A. Characteristic of patient

All respondent in this research have age 0 day. Among 17 respondents majority is male as

much as 11 respondents (65%) and female as many as 6 respondents (35%). The characteristic based on gestasional age show 17 respondents obtained gestational age 31-33 weeks were 13 respondents (76%), 34- 36 weeks gestational age of 4 respondents (24%). Based on result, 17 respondents explained that most types of labor Normal / spontaneous as many as 10 respondents (59%) and a small portion sectio caesare kind of labor as much as seven respondents (41%). 17 respondents most weight from 2000 to 2400 grams of respondents by 5 respondents (29%) and some weight from 1500 to 1900 grams of respondents as many as 12 respondents (71%). Apgar score of 17 respondents severe asphyxia respondents as many as 17 respondents (100%).

B. Efectivity of bubble CPAP to down score in neonates with RDS

Table 4.1. Comparison down score before and after using bubble CPAP in NICU Dr. Ramelan Navy Hospital Surabaya.

Observation	Pre	Post 1	Post 2	Post 3	Post 4	Post 5
Severe RDS (≥ 6)	17	17	14	5	0	0
Moderate RDS(4-5)	0	0	3	11	10	0
Mild RDS(1-3)	0	0	0	1	7	17
P- value : 0,000						

Based on the results showed that before used Bubble CPAP, 17 respondents (100%) had severe respiratory distress. On the 1st post treatment, RDS decreased slightly but still in the level of heavy distress among 17 respondents (100%). On the 2nd post treatment, decreased respiratory distress among 14 respondents (82%), respiratory distress was 3 respondents (18%). In the 3rd post treatment decreased respiratory distress 5 respondents (30%), respiratory distress were 11 respondents (65%), and mild respiratory distress 1 respondents (6%). In the 4th post treatment no severe respiratory distress, decreased respiratory distress were 10 respondents (59%), mild respiratory distress seven respondents (41%), and the 5th post treatment has experienced many mild respiratory distress decline 17 respondents (100%).

Analysed was used friedman test then post hoc by using wilcoxon showed p value < 0,005, its mean theres differences of down score before and after treatment with bubble CPAP. Then post hoc test was used to analyse time of differences down score from pre test, and post test 1st , 2nd , 3rd and 5th day. All of post hoc test showed p<0,005. Its means that bubble CPAP was effective as treatment to reduce severity RDS.

Discussion

a. Down score before treatment by using bubble CPAP among neonates with severe RDS

All baby have severe RDS before using bubble CPAP. It shows in table 4.1. that all baby have severe RDS. Neonatal respiratory problems are the main factors affecting the down score, this happens due to preterm infants, or preterm. This situation occurs in about a quarter of babies born at 32 weeks' gestation and the incidence increases with gestation period is also shortened due to surfactant deficiency (PONEK, 2011: 229) which relates to the development of lung maturity in premature infants caused by alveoli is still so small that difficulties developing , the development of a less than perfect because the walls of the thorax is still weak, surfactant production is less than perfect, deficiency of surfactant resulted in the collapse of the alveoli so that the lungs become stiff. This causes changes in lung physiology so that power lung development (compliance) decreases (Suriadi and Yuliandi.2001).

Crostabulation between pregnancy with pre usage Bubble CPAP obtained 17 respondents (100%) were in severe respiratory distress consisting of 13 respondents (77%) neonates with a gestational age of 31-33 weeks and 4 respondents (23%) neonates with gestational age 34-36 weeks. At crosttab gestation with post 1 Bubble CPAP use was not found mild respiratory gravity changes, decline the gravity of neonatal breathing occurs in post 2, this is evidenced by the output krostab gestation with post 2 which states there are 11 respondents (65%) of the 13 respondents (77%) neonates 31-33 weeks gestation are at the gravity of the heavy breathing as much as 2 respondents (12%) are in the medium gravity breath. At 34-36 weeks gestational age neonates there are 3 respondents (17%) in the classification of severe respiratory distress and as much as 1 respondents (6%) in moderate respiratory distress classification. At krostab post 3 obtained by 4 respondents (23%) showed severe respiratory distress classification, as many as nine respondents (53%) were classified gravity breath, and neonates with a gestational age of 31-33 weeks, and as many as 1 respondents (6%) are in severe respiratory distress, as many as two respondents (11%) were in moderate respiratory distress and as much as 1 respondents (6%) were in mild respiratory distress.

It is supported on the incidence of gravity breath in neonates is inversely related to gestational age and weight, which means the young age of the mother's pregnancy the higher incidence of the gravity of breathing in neonates (Surasmi, 2003).

From the observation results show the value down scores Bubble CPAP usage in 17 examination (100%) neonates with severe respiratory distress showed some classification consists of a, male gender as much as 11 respondents (65%) and female sex as much as 6 respondents (35%), 1500-1900 gram weight as much as 12 respondents (71%) and weight from 2000 to 2400 grams by 5 respondents (29%), age neonates 0 days as many as 17 respondents (100%), the type of normal labor / spontaneous as many as 10 respondents (59%), type sectio cesarean delivery as much as seven

respondents (41%), gestational age 31-33 weeks were 13 respondents (76%) and gestational age of 34-36 weeks of four respondents (24%), classification asphixia weigh as much as 17 respondents (100%). Asphixia weight is influenced by factors of the mother or the history of the baby when it comes out of the delivery room that causes respiratory distress consisting of dispnue or hiperapnea with respiratory frequency of more than 60x / min, cyanosis, moans, the expiration and disorders of the respiratory muscles on inspiration (Wahyuni, 2001: 27).

b. Down score after treatment by bubble CPAP in naonates with severe RDS

From the observation data obtained during the 5-day inspection, the pre obtained 17 respondents (100%) severe respiratory distress, on the first day of the change has not been obtained, gradually on day two began to change from severe respiratory distress as much as 14 respondents (82%) while the percentage of moderate respiratory distress three respondents (18%), on day three respiratory distress weight to as much as 5 respondents (29%), respiratory distress were as many as 11 respondents (65%), mild respiratory distress 1 respondents (6%) in the fourth day of decline no severe respiratory distress, respiratory distress were 10 respondents (59%) and mild respiratory distress seven respondents (41%), while gradually clinical condition on the fifth day decline into mild respiratory distress as much as 17 respondents (100 %).

On the results of the post crostab gestational age 4 found a decrease in the use of Bubble CPAP breathing heavy gravity well at the gestational age 31-33 weeks and 34-36 weeks gestation. A decrease of severity of neonatal breathing this is evidenced by the output krostab gestational age with post 4 which states there are 9 respondents (53%) of the 11 respondents (65%) neonates with 31-33 weeks gestational age are at moderate respiratory distress, and as many as four respondents (23%) were in mild respiratory distress, while there is one respondents (6%) are in moderate respiratory distress, a total of three respondents (17%) were in mild respiratory distress neonates with gestational age 34-36 weeks. On the results of the weight krostab post 4 Use Bubble CPAP obtained 4 respondents (23%) of the 12 respondents (71%) neonates weighing 1500 to 1900 grams were in mild respiratory distress. While the obtained three respondents (17%) of the total 5 neonates weighing 2000 to 2400 g (29%). This is because the use of Bubble CPAP that have a physiological effect to improve lung development, maintain the function of surfactant and reduce excessive respiratory effort (PONEK, 2008).

Management according to Surasmi et al (2003) action to address the gravity of respiratory problems include maintaining adequate ventilation and oxygenation, maintaining acid-base balance, maintaining a neutral environmental temperature maintaining adequate tissue perfusion to prevent hypothermia, maintain adequate fluid and electrolyte therefore required optimal treatment is needed Bubble CPAP which is a tool to maintain a positive pressure in the airways during

spontaneous breathing neonates (MOH, 2008).

Bubble CPAP prevent the collapse of the alveoli, improving and increasing the functional residual capacity (FRC), lung and oxygenation, improve lung development, maintain the function of surfactant and maintain airway and diaphragm, stimulate growth and provide conformity perfusion lung better ventilation and reduces the effort to breathe excessive. Infection control is a serious factor for the survival of infants and lung governance, which should be considered sterile keep the airway and proper hand washing before touching the CPAP equipment.

The procedure for the treatment of neonates with CPAP checkup every 2-4 hours, treatment with CPAP babies with sucking cavity, mouth, pharynx and stomach needs in accordance with the needs of an effort to increase the need for O2 and episodes apnue and with regard to the number, consistency and color of secretions. Examination of breast milk intake of nutrients particularly well with continuous sonde method and when conditions allow the baby can be a way infants breastfed by mothers (Enkin.et al. 2001) further observations by NICU nurses every 24 hours. Bubble CPAP usage impacts that changes in impairment scor down gradually in neonates with respiratory distress, marked frequency <60x / min, no cyanosis, no retraction, good breath sounds and no merintih.Dari results of the data obtained on the second day severe respiratory distress into respiratory distress was on the third day due to the age of 34-36 weeks gestation (24%) who weigh 2000 to 2400 grams (29%) the effect on the decrease in its value down scor undergone significant changes.

c. Efectivity of bubble CPAP to down score in neonates with severe RDS

Results of observation data obtained from 17 respondents obtained impairment scor neonatal down for 5 days inspection before use Bubble CPAP 17 respondents (100%) had severe respiratory distress and the post to the five already experienced many mild respiratory distress decline 17 respondents (100%).

From the statistical test friedman test results obtained p = 0.000, which means there is a difference value down scores before and after the use of Bubble CPAP, after comparison value down his score each day with post hoc test pre -Post 1 obtained p = 0.003, which means there is a difference, after the test post hoc analysis using the wilcoxon statistical test and post hoc test for data showed that p = 0.000 <0.05 means that H1 is accepted, this suggests that the use of Bubble CPAP provides effective influence to lower down the value of the score in neonates with respiratory distress weight.

Bubble CPAP maintain positive airway pressure used to provide respiratory support is an attractive option to support neonates with respiratory disorders, because the baby's breathing normally range 40-60x / min, heart rate ranges between 120-140x / min (bed), up to 180x / min (crying), good oxygen saturation 88-94%. Bubble CPAP is still considered to be effective and resource-intensive, it requires skilled and experienced staff to ensure the success of the treatment and can lead

to increased risk of pneumothorax and nasal trauma (Perinasia, 2011).

At crostab gestation with post 5 Bubble CPAP use found a decrease in respiratory distress classification this is evidenced by the 13 respondents (78%) neonates with a gestational age of 31-33 weeks were on the classification of mild respiratory distress prior to the severe respiratory distress pre and post 1 and obtained four respondents (23%) neonates with a gestational age of 34-36 weeks. At krostab weight by post 5 Bubble CPAP use found a decrease in respiratory distress this classification attested by the presence of 12 respondents (71%) neonates weighing 1500 to 1900 grams, obtained five respondents (29%) neonates weighing 2000 to 2400 gram are in the classification of mild respiratory distress prior to the severe respiratory distress in the pre and post 1 .perubahan is characterized by a decrease in respiratory rate in the normal range 40-60x / min and no retraction of chest, heart rate within normal limits 120-160x / minutes, normal neonates crying, no moaning and no cyanosis of skin color.

Clinical features which may occur in neonates should increase clinical awareness of impending respiratory failure, among others, an increase in respiration, increased effort breath, periodic breathing, apnea, cyanosis, which is not reduced by the administration of oxygen, decreasing blood pressure accompanied by tachycardia, pallor, circulatory failure will be followed by bradycardia use respiratory muscles tambahan.Hal happens because there are several factors that influence from the most severe respiratory distress in infants at high risk of preterm (Surasmi, et al 2003). Score down a more comprehensive scoring system and can be used on all pregnancy, in addition to assessing the severity of respiratory distress occurs, it is necessary to estimate the assessment also the basic cause breathing disorders for further management administration Continuous positive airway pressure (CPAP) would improve oxygenation and survival, even Bubble CPAP may prevent the use of a mechanical ventilator, to increase lung volume and improve respiration, Bubble CPAP make the alveoli remain open, and as adjunctive therapy in the treatment of surfactant (Sholeh.2009: 140).

Conclusion and Recommendation

Bubble CPAP was effective for treatment among neonates with severe RDS. The result from this research showed that there is decrease down score measurement after treatment with bubble CPAP. It was recommended to used bubble CPAP to decrease severe RDS among neonates.

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