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# "A study to assess the effect of hydrogel application on nasal skin breakdown among the infants receiving Continuous Positive Pressure Airway from NICU of selected hospitals at Sangli Miraj & Kupwad corporation area."

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**ABSTRACT**

**Introduction:** Based on to date data, more than one in 10 neonates are born preterm worldwide. According to World Health Organization (WHO), incidence of preterm birth ranges from 5% in European countries to 15% in African countries and Africa and South Asia account for 60% of them. Based on a review study in 2015, the incidence rate of preterm birth in Iran of preterm birth worldwide, critical care in the first days after birth is a key factor in survival of preterm newborns. Preterm birth is defined as livebirth that occurs before 37 completed weeks or 259 days of gestation.[1]

**OBJECTIVES:**

1.To assess the existing level of nasal skin breakdown in control & experimental group.

2. To assess the post-test status of nasal skin breakdown in control & experimental group.3. To compare the post-test nasal skin breakdown score between control and experimental group. **HYPOTHESIS:** $H_0$ - There is no significant difference between post-test score of control & experimental group for nasal skin breakdown score.

$H_1$ - There is a significant difference between post-test score of control & experimental group for nasal skin breakdown score.

**MATERIAL AND METHOD:** The quasi-experimental two group pre-test post-test research design was conducted to assess the effectiveness of hydrogel application on nasal skin breakdown. Total 40 samples were selected by non-probability purposive sampling method. Neonatal nasal skin observation table is used to assess the nasal skin breakdown.

**RESULT AND CONCLUSION:** It is evident that the mean score of nasal skin breakdown is significantly less in experimental group as compared to control group. It concludes that the hydrogel therapy is effective in reducing nasal skin breakdown. And it can be used for nasal skin breakdown in NICU.

**Key words**: **Assess, Effect, Hydrogel application, Nasal skin breakdown, Infants Continuous Positive Pressure Airway**

# Introduction

## BACKGROUND OF THE STUDY

Nasal continuous positive airway pressure (CPAP) is a noninvasive form of respiratory support, which will assist an infant who is spontaneously breathing, enabling their respiratory drive to work. CPAP is delivered via the nasal airway opening with the use of nasal prongs or a nasal mask, which is generally is effective method. But there are some issues associated with CPAP are discomfort and skin breakdown or injury to the nasal area due to tight fitting of prongs.[2]

Neonates, particularly those born premature, may require ventilation assistance immediately after birth since their lungs may not be fully developed. The use of nasal continuous positive pressure (CPAP) is increasing as a means of respiratory support in many premature infants. So, the presence of nasal skin breakdown may be seen as a complication. Preterm birth is defined as live birth that occurs before 37 completed weeks or 259 days of gestation. Prematurity can be further classified based on birth weight or neonates categorized into extremely preterm (<28weeks), very preterm (32to <37) completed weeks of gestation. With respiratory distress syndrome using an appropriate nasal skin care protocol is identical to prevention or infection of nasal skin breakdown in those who received CPAP. This study aimed to investigate the effect of an hydrogel application o n nasal skin breakdown in neonates.[3]

Also, the use of noninvasive ventilation may damage to facial skin tissue, which affects both the efficacy of the intervention and the patient quality of life. [5]

Preterm infants on CPAP need special attention and close monitoring by health care providers to assure proper delivery of pressure to the alveoli. The nasal skin of the preterm infant is very fragile, which makes it susceptible to breakdown if continuous CPAP delivery because a severe nasal skin breakdown can be a satisfactory reason for discontinuing the use CPAP. Health professionals in nasal breakdown, which occurs due to longer duration of CPAP. When caring for preterm infants with CPAP prongs nurses should monitor for signs of nasal trauma such as dryness, redness, bleeding, abrasion of the skin and narrowing the nasal passage.[6]

Nasal skin breakdown in preterm infants receiving CPAP is preventable. Several nursing Cares are essentials to prevent or decrease the risk of a nasal breakdown in these infants treated with CPAP. Selecting the right mask size, using a tolerable pressure for fixing the interface, proper fitting of CPAP prongs or mask, avoiding overtightening of the head strap, and using Hydrogel are some essential care modalities used to decrease the risk of interface-associated nasal skin breakdown.[7]

## NEED FOR STUDY

According to the world health organization the incidence of preterm infants 60% in south ASIA. The high rate of preterm infants worldwide, critical care is the first days after the birth is key factor in survival of preterm new-borns.

Neonates born preterm are at high risk of a no. of prematurity related complication respiratory support is vital care in preterm neonates with respiratory failure or respiratory distress. Approximately all patients in NICU need a method of O2 therapy. NCPAP is the most common method of CPAP in NICU, Nasal CPAP applies constant pressure of forced air into lungs.

Nasal skin damage in neonate receiving NCPAP is preventable. The care is important to prevent or decrease the risk of nasal breakdown in patients who are treated with NCPAP.

The Hydrogel are important care modalities which are used to decrease risk of interface – associated nasal skin breakdown. These caring interventions for prevention of nasal skin breakdown. Therefore, the study will be conducted to examine the effect of hydrogel application on nasal skin breakdown in neonates receiving NCPAP.[1]

Hydrogel materials have become ideal in wound dressing research due to their high-water content, good biocompatibility, and adjustable physicochemical properties. Compared with traditional dressings, such as gauze, hydrogel dressings can provide a moist environment for wound healing. This review summarizes hundreds of typical studies on the sources, preparation methods, and mechanisms to understand collagen-based hydrogels for wound dressings. Additionally, this review focuses on the results of in vitro and in vivo experiments based on collagen hydrogels for skin regeneration and wound healing.[9]

A study done by Khadiga M., Rawia M…et al in 2019 in her study she concludes that there is need for nurse's care for preterm infants to reduce regarding nasal skin breakdown who were receiving nasal continuous positive airway pressure (CPAP). A quasi-experimental design was used and the study was done in NICU. They have taken convenient 77 total sample divided in two groups 35 in control group and 42 in the study group. The findings revealed a statistically significant difference pre and post-nursing protocol implementation regarding CPAP. ($p<0.001$) They concluded that the there is need for nursing protocol for nurses caring for preterm infants to reduce nasal skin breakdown and there should be effective and safe non-invasive intervention in all NICU.[5]

**Research Problem Statement:**

**"A study to assess the effect of Hydrogel application on nasal skin breakdown among the infant receiving continuous positive pressure airway from NICU of selected hospitals at Sangli Miraj & Kupwad Corporation area."**

## RESEARCH OBJECTIVES

1. To assess the existing level of nasal skin breakdown in control and experimental group.
2. To assess the post-test status of nasal skin breakdown in control and experimental group.
3. To compare the post-test nasal skin breakdown score between the control & experimental group.

## HYPOTHESIS

$H_0$ - There is no significant difference between post-test score of control & experimental group for nasal skin breakdown score.

$H_1$ - There is a significant difference between post-test score of control & experimental group for nasal skin breakdown score.

**MATERIAL AND METHOD:** In this study quantitative research approach was adopted. The quasi-experimental two group pre-test post-test research design was selected to assess the effectiveness of hydrogel application on nasal skin breakdown with observation table as a tool. Total 40 samples were selected by non-probability purposive sampling method. Neonatal nasal skin observation table was used to assess the nasal skin breakdown. Independent variable was Hydrogel, Dependent variable was nasal skin breakdown. In the present study, the sample selected for the data collection were infants having nasal skin breakdown due to CPAP who fulfilled the criteria from selected NICU of Sangli, Miraj and Kupwad corporation area.

SAMPLING CRITERIA: **Inclusion criteria-**Infants who are on CPAP and suffering with the nasal skin breakdown.**Exclusion criteria-**Those babies whose mothers are not willing to include their babies in the study.

**ETHICAL CONSIDERTAION:**

Research proposal with data collection tool was presented in front of ethical committee. After approval of the ethical committee pilot study and final study were conducted, where it was promised that there will be no discomfort or risk to the participants and the received information will be kept confidential. The participation was voluntary. Participations can skip the study in the any period. The prior permission from concerned authority was taken and informed written consent form each participant was taken. **RELIABILITY:**The tool used is Neonatal nasal skin breakdown observation scale.Inter-rater method was used with help of Karl Pearson formula. to check tool reliability.6 samples were selected. The reliability coefficient r = 0.96, which is more than 0.7 Hence tool was found to be reliable.

**PROCEDURE FOR DATA COLLECTION:**

Prior permission from concerned authority was taken consent from the parents was taken, nasal skin breakdown assessment during procedure by neonatal nasal skin breakdown score. The hydrogel therapy was applied in experimental group and for control group hospital routine will be continued.

This hydrogel application was continued for 7 days and then post-test was taken on $8^{th}$ day.

The data was collected in 3 parts:

**Preintervention phase: Phase1**- Demographic data was collected from parents of sample in experimental and control group and skin breakdown was assessed.

**Intervention phase: Phase 2-** In experimental group hydrogel was applied on nasal skin breakdown. In control group hospital routine was carried out.

**Post intervention phase: Phase 3**- the level of nasal skin breakdown was assessed with the help of neonatal nasal skin breakdown score in both experimental and control group on $8^{th}$ day after pre-test.

**PILOT STUDY:**

Pilot study is conducted to check the feasibility of study.

Sample- 10 (5+5)

Setting- from selected NICUs of Sangli Miraj- Kupwad Corporation area.

The hydrogel therapy was applied in experimental group and in control group hospital routine was continued. The hydrogel application was continued for 7 days and then post-test was taken on 8th day.

It was found feasible to conduct main study.

**Organization of the findings:**

The analysis and interpretation of the findings are given in the following selection.

**Section- I**- Frequency and percentage wise distribution of the socio-demographic variables.

**Section- II**- Assessment of nasal skin breakdown among babies in experimental and control group according to pre- test.

**Section- III** - Assessment of nasal skin breakdown among babies in experimental and control group according to post- test.

**Section-IV**- Comparison of nasal skin breakdown between control and experimental group.

**Table no.1**

**Table No 1: Frequency and percentage wise distribution of the socio-demographic variables.**

**n= 20+20**

| Sr. No. | Demographical Variables | | Experimental Group | | Control Group | |
|---|---|---|---|---|---|---|
| | | | Frequency | Percentage | Frequency | Percentage |
| **1.** | **Age in days** | 10-15 Days | 1 | 5% | 1 | 5% |
| | | 16-20 Days | 7 | 35% | 7 | 35% |
| | | 21-25 Days | 2 | 10% | 7 | 35% |
| | | 26-30 Days | 7 | 35% | 4 | 20% |
| | | 31-35 Days | 3 | 15% | 1 | 5% |
| **2.** | **Gestation age** | 27- 29 Week | 1 | 5% | 4 | 20% |
| | | 30- 32 Week | 1 | 5% | 5 | 25% |
| | | 33- 35 Week | 6 | 30% | 6 | 30% |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 36- 38 Week | 12 | 60% | 5 | 25% |
| **3.** | **Duration of CPAP** | 10- 15 Days | 5 | 25% | 3 | 15% |
| | | 16- 20 Days | 10 | 50% | 10 | 50% |
| | | 21- 25 Days | 1 | 5% | 3 | 15% |
| | | 26- 30 Days | 4 | 20% | 4 | 20% |

The above table describes that, according to age in days- in experimental group 5% of babies were from 10-15 days and 35%were from 16-20 and 26-30 days and 10%were from 21-25 days and 15% were from 31-35 days. In Control group 5% were from 10-15 and 31-35days and 35%were from 16-20 and 21-25 days and 20%were from 26-30days.According gestation age- in experimental group 5% were from 27-29 and 30-32 week and 30% were from 33-35 and 60% were from 36-38 week. In Control group 20% were from 27-29 week and 25 were from 30-32 and 36-38 week and 30% were from 33-35. According duration of CPAP- in experimental group 5% were from 10-15 days and 50 were from 16-20 days and 5% were from 21-25 days and 20% were from 26-30 days. In Control group 15% were from 10-15 and 21-25 days and 50% were from 16-20 days and 20% were from 26-30 days.

**Table No. 2**

**Pre-test assessment of nasal skin breakdown among babies in experimental and control group.**

**n= 20+20**

| **Characteristics** | **Experimental Group** | | **Control Group** | |
|---|---|---|---|---|
| | **Mean** | **S.D.** | **Mean** | **S.D.** |
| Colour of skin | 2.55 | 0.7591 | 2.25 | 0.6386 |
| Dryness | 1.9 | 0.3077 | 1.65 | 0.4893 |
| Nasal skin integrity | 1.75 | 0.5501 | 1.8 | 0.4103 |
| Pain on touch | 2.8 | 0.6958 | 2.4 | 0.5982 |

**Table no 2,** depicts that for color of the nasal skin the mean score is 2.55 in both experimental group and control. For dryness the mean score is 1.9 in experimental group, where in control

group it is 1.65. For nasal skin integrity mean score is1.75 in experimental group and in control group it is 1.8. For pain mean score is 2.8 in experimental group, and in control group it is 2.4.

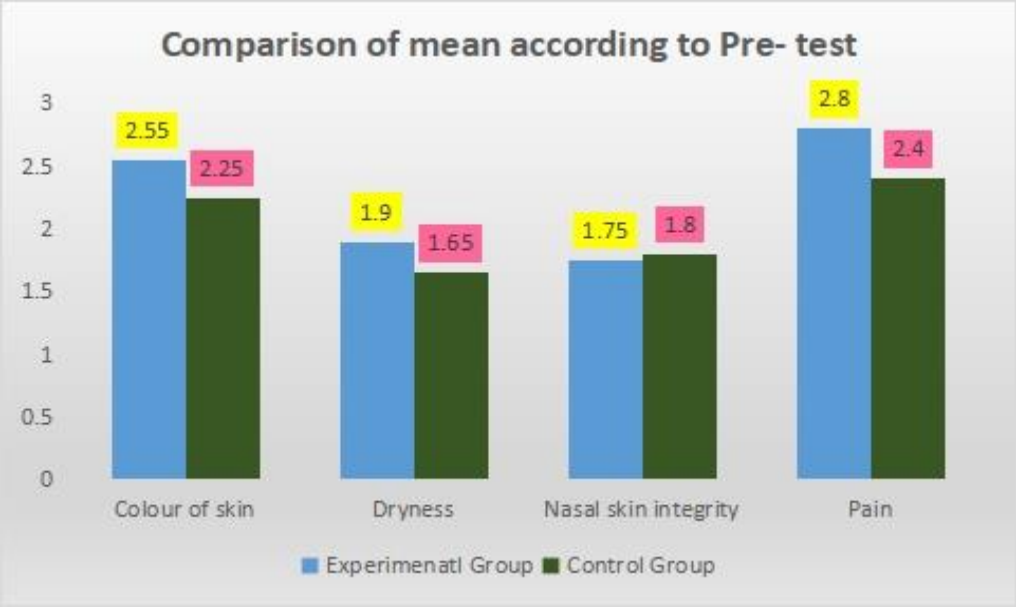


**Table no.2:** Comparison of pre-test according to control and experimental group.

**Table No. 3**

**post- test assessment of nasal skin breakdown among babies in experimental and control group.**

**n=20+20**

| **Characteristics** | **Experimental Group** | | **Control Group** | |
|---|---|---|---|---|
| | **Mean** | **S.D.** | **Mean** | **S.D.** |
| Colour of skin | 1.1 | 0.3077 | 2.4 | 0.6805 |
| Dryness | 1 | 0 | 1.8 | 0.4103 |
| Nasal skin integrity | 1.05 | 0.2236 | 1.85 | 0.3663 |
| Pain on touch | 1.1 | 0.3077 | 2.9 | 0.9119 |

**Table no 3**, depicts the for colour of the nasal skin the mean score is 1.1 in experimental group, where in control group it is 2.4. For dryness the mean score is 1 in experimental where, in control group it is 1.8. For nasal skin integrity mean score is 1.05 in experimental where, in control group it is 1.85. for pain mean score is 1.1 in experimental where, in control group it is 2.9.

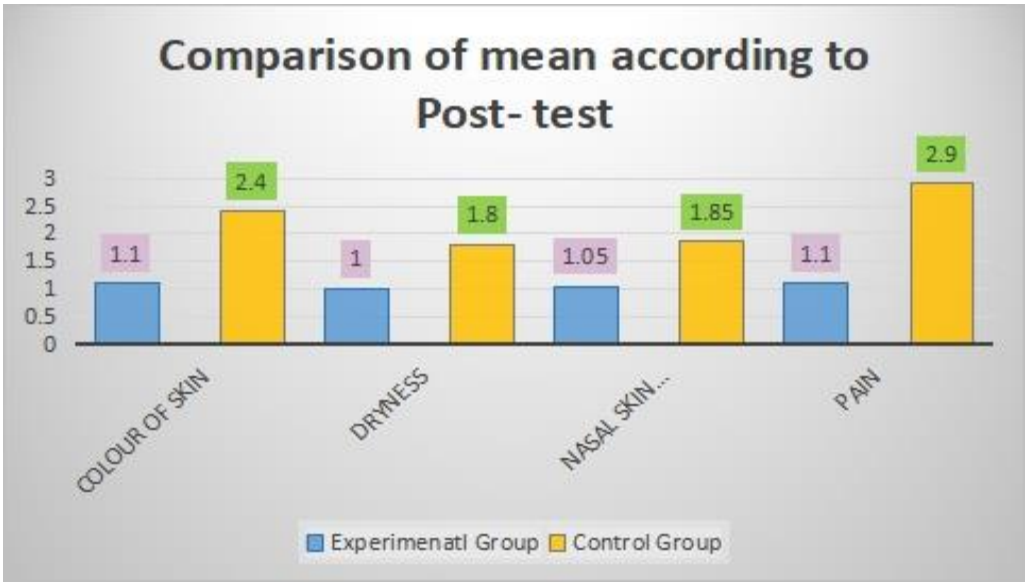


**Table no.3:** Comparison of post-test according to control and experimental group.

**Table no. 4**

**Comparison of post-test between control and experimental group.**

**n=20+20**

| Characteristics | Pre- test | | Post- test | | t- value | p-value |
|---|---|---|---|---|---|---|
| | Mean | S.D. | Mean | S.D. | | |
| Colour of skin | 1.1 | 0.3077 | 2.4 | 0.6805 | -7.7836 | 0.00001 <0.05 |
| Dryness | 1 | 0 | 1.8 | 0.4103 | -8.7178 | 0.00001 <0.05 |
| Nasal skin integrity | 1.05 | 0.2236 | 1.85 | 0.3663 | -83358 | 0.00001 <0.05 |
| Pain on touch | 1.1 | 0.3077 | 2.9 | 0.919 | -8.3638 | 0.00001 <0.05 |

Table no 4, depicts the calculated P value for all the characteristics is less than 0.05 hence there is significant difference is found between post-test in Experimental and Control group for colour of skin, dryness of skin, nasal skin integrity and pain**.**

**DISCUSSION**

In present study it has observed that the p- value for of nasal skin breakdown between control and experimental group is less than 0.05 it indicates that there is significant difference between post-test score of control & experimental group, hence the null hypothesis is rejected. It is evident that the mean score of nasal skin breakdown is significantly less in experimental group

as compared to control group. It concludes that the hydrogel therapy is effective in reducing nasal skin breakdown. And it can be used for nasal skin breakdown in NICU.

A study done by Jing Y, Qing Z…et al in 2021 with the aim of to evaluate the clinical study on prevention of nasal injury during continuous positive airway pressure in neonates. A randomized control trial design was used and they taken 106 total sample size divided into observation group (n=53) and control group (n=53). The control group of neonates used U-shaped nasal plugs during trans nasal continuous positive airway pressure ventilation, while the observation group apply the hydrocolloid dressing on nasal skin breakdown according to the size of children's nostrils. The findings reveled that in the observation group was significantly lower than that in the control group and the difference was statistically significant ($p<0.05$). They concluded that the use of hydrocolloid dressings to protect the skin of the nasal congestion fixation method can significantly reduce the incidence of skin damage.[10]

## CONCLUSION:

In the present study to assess the effect of hydrogel application on nasal skin breakdown. In experimental group the hydrogel therapy was applied in twice a day and continued for 7 days, and then post- test was taken after 7 days. Findings of the study clearly indicate that the nasal skin breakdown is significantly less in experimental group as compared to control group hence the null hypothesis is rejected at 0.05 level of significance**.**

## NURSING IMPLICATION:

The results of the present study have brought out certain facts that have for reaching implications for nursing in the area of practice, nursing education, nursing administration and nursing research.

### Nursing practice

The study findings will help the NICU staff to play vital role for providing effective nursing practice with application of hydrogel on nasal skin breakdown.

### NURSING EDUCATION:

The study findings will help the nurse educator to teach staff nurses about application of hydrogel therapy on nasal skin breakdown.

The study findings will help the nursing tutor to introduce the hydrogel application to treat nasal skin breakdown and encourage the students to use evidence-based practice effectively.[11]

### NURSING ADMINISTRATION:

The study findings will help the nursing administrators to take the initiatives in developing policies and plan in service education to educate NICU staff about hydrogel therapy on nasal skin breakdown.

The nurse administrator at various levels can play vital role to observe and evaluate this intervention of application of hydrogel therapy on nasal skin breakdown for early healing.[12]

**NURSING RESEARCH:**

The study findings will be disseminated to the nurses working in NICU and student nurses through workshop and conferences.

The present study result will be published in national and international journals.[13]

**RECOMMENDATIONS OF THE STUDY**

A similar study can be conducted on a large population for generalization.

A comparative study can be conducted between application hydrogel therapy verses silicone gel.

A study can be done to assess the effect of hydrogel therapy on wound healing.

A similar study can be conducted in PICU settings.

**Ethical Permission**: Ethical permission was taken for Institutional Ethical Committee of BVDU, College of Nursing, Sangli

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