

A Study to Assess the Effectiveness of Protective Techniques of Facial Pressure Ulcer Among Patients on Non-invasive Mechanical Ventilation in PCCM Department at Pt. B.D. Sharma PGIMS Rohtak

Sahil Nandal^{1,*}, Hemwati², Pawan Kumar Singh³

Abstract

The study aimed to assess the effectiveness of protective techniques in preventing facial pressure ulcers among patients on non-invasive mechanical ventilation in the Post-Critical Care Management (PCCM) department at Pt. B.D. Sharma PGIMS, Rohtak. Facial pressure ulcers are a common complication in patients undergoing non-invasive mechanical ventilation, often resulting from prolonged pressure on facial tissues due to mask contact. This descriptive study involved a sample of 60 patients receiving non-invasive mechanical ventilation. Protective techniques such as repositioning the patient, the use of cushioning materials, and frequent skin assessments were implemented as interventions. Data were collected through observational checklists, which included factors like mask fit, frequency of repositioning, and incidence of facial pressure ulcers. The results demonstrated a significant reduction in the occurrence of facial pressure ulcers among patients who received these protective measures compared to those who did not. This study highlights the importance of preventive strategies in the PCCM department and emphasizes the role of nursing staff in implementing such techniques to enhance patient care. The findings suggest that systematic use of protective techniques can significantly reduce the risk of facial pressure ulcers, improving patient comfort and reducing treatment costs. Further research is recommended to explore the long-term effects of these protective interventions and their application in other critical care settings.

Keywords: Protective techniques, facial pressure ulcers, non-invasive mechanical ventilation, PCCM department, patient care

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INTRODUCTION

According to Paus-Jenssen *et al.*, selecting the appropriate ventilatory interface is crucial for achieving optimal results with NIV. Typically, the nasal mask is more comfortably tolerated, whereas the oro-nasal mask leads to a quicker decrease in carbon dioxide partial pressure (pCO₂). The ideal ventilation mask must be distensible, comfortable, lightweight, easy to apply, latex-free, and available in or adaptable to different sizes; it must also provide low resistance to airflow and have the smallest possible dead space. The mask fixation, which should be simple, is generally done with Velcro ribbons, elastic strips and a fixation harness [1].

The rate of subjective mask discomfort can reach up to 50%, but in most instances, it can be addressed by adjusting or replacing the mask. In patients with chronic conditions, the main adverse effects of NIV are dry mouth, nasal congestion, gum pain, claustrophobia and the effects generated by air leaks; however, when NIV is used in acute patients, PUs on the skin in contact with the mask are the main adverse events [2].

Published literature about PUs is also abundant. However, there has been a paucity of publications combining these two subjects. This may be due to the fact that, until now, research has focused on the prevention and treatment of PUs at more traditional locations, such as the sacrum and heels [3].

Schallom *et al.* described the use of NIV as a therapy bearing the risk of producing suffering and pain during its use in the form of FPU, and later on, in the form of scars disfiguring the face. The occurrence of pressure ulcers in patients using nasal-oral compared to full-face non-invasive ventilation masks [4].

Raurell-Torreda *et al.* found a 20% incidence of NIV-related FPU (NIV-R FPU) in intensive care unit (ICU) patients ventilated with oro-nasal masks. However, they did not deal with the possible effect of preventive measures to avoid the development of NIV-R FPU [5].

Black *et al.* assessed how to optimize interventions in NIV. The authors followed 387 patients who were hospitalized mainly in critical care units. Skin nasal lesions were presented as adverse events and seemed to be directly correlated with the level of air leaks around the masks. The incidence of nasal skin lesions was 2.4%. The possible cause, as suggested by the authors, was the fact that nurses tended to press the mask tightly against the skin. External pressure and medical device-related PUs: If we consider the increasing number of materials and clinical devices used with diagnostic or therapeutic purposes capable of producing external pressure, it would be reasonable to expect an increased number of medical device-related PUs in hospitalized patients [6].

Initially, as non-invasive barometric ventilators compensate autonomously for small air leaks, our HDU used the lowest effective pressure on the mask's fixation harness to prevent the development of NIV-R FPU and, at the same time, increase the patient's comfort by allowing small air leaks to encourage the tolerance of NIV. Nurses also applied different dressings on the most exposed areas, aiming to decrease the pressure exerted by the mask on the patient's face [7].

Dellweg *et al.*: A study by Weng²⁴ showed the potential protective effect of hydrocolloid and polyurethane dressings on NIV-R FPU. However, Acorda described that foam dressings, even if not strongly adhesive, redistributed pressure better than hydrocolloid dressings. Our literature review on the subject found different studies showing large variability on the preventive measures, as well as highly dispersed results about the incidence of NIV-R FPU [8].

NEED FOR THE STUDY

Over the past two decades, there has been a growing trend in using non-invasive ventilation (NIV) therapy to manage various conditions leading to acute respiratory failure. NIV devices have steadily become the first-line treatment for these conditions. However, a significant side effect of using these devices is the development of facial skin pressure ulcers or damage. This skin damage significantly impacts the patient's quality of life, treatment adherence, and comfort, as well as presenting challenges in wound care management. The goal of this study is to provide evidence-based recommendations for selecting and applying treatments for facial pressure ulcers those related to NIV interfaces.

OBJECTIVES

1. To evaluate the effectiveness of various therapeutic strategies in preventing the formation of facial pressure ulcers (FPU) associated with the use of non-invasive mechanical ventilation (NIV) with oro-nasal masks in critically ill hospitalized patients.

2. To correlate the findings with specific demographic variables of patients receiving non-invasive mechanical ventilation in the PCCM department at Pt. BD Sharma, PGIMS, Rohtak.

Variables

- *Independent Variables:* Protective techniques.
- *Dependent Variables:* Facial pressure ulcer.

OPERATIONAL DEFINITIONS

1. *Effectiveness:* effectiveness refers to improvement in the incidence of facial pressure ulcer among patients on non-invasive mechanical ventilation in PCCM department at Pt. BD Sharma PGIMS Rohtak.
2. *Facial Pressure Ulcer:* Facial pressure ulcers are the areas of damage on the facial skin and underlying tissue caused by constant pressure.
3. *Non-invasive mechanical ventilation:* Non-invasive mechanical ventilation involves supplying oxygen to the lungs through positive pressure without the need for endotracheal intubation.
4. *PCCM:* Pulmonary and Critical Care Medicine.
5. *Protective techniques:* Coconut Oil.

ASSUMPTIONS

1. Patients under non-invasive mechanical ventilation are prone to facial pressure ulcers.
2. Coconut oil is effective for prevention of facial ulcers for patients under non-invasive mechanical ventilation.
3. Protective techniques may decrease the chances of facial pressure ulcers in patients under non-invasive mechanical ventilation.

HYPOTHESIS

- *H0:* There will be no significant effect of protective techniques on facial pressure ulcers on the patients under non-invasive mechanical ventilation.
- *H1:* There will be significant effect of protective techniques on facial pressure ulcers on patients under non-invasive mechanical ventilation.

DELIMITATION

1. Patients under mechanical ventilation who were admitted in PGIMS Rohtak.

CONCEPTUAL FRAMEWORK: THEORY BY LUDWIG VON BERTALANFFY, 1968

Input

Input is any form of energy, information, material, or human resource that enters a system through its boundary. In the present study, input refers to assess the effectiveness of protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation in PCCM department at Pt. B.D. Sharma, PGIMS, Rohtak.

Throughput

Throughput is the process that takes place between the input and output stages, allowing the input to be transformed into output in a way that it can be easily utilized by the system. In this study, throughput refers to the application of coconut oil on the faces of non-invasive patients.

Output

Output is the energy, material, or information that is released into the environment. Change is the feature of the process that is observable and measurable as output, which should be different from that which is entered into the system i.e., input. In the present study, output refers to assess the results of protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation in PCCM department at Pt. B.D. Sharma, PGIMS, Rohtak (Figure 1).

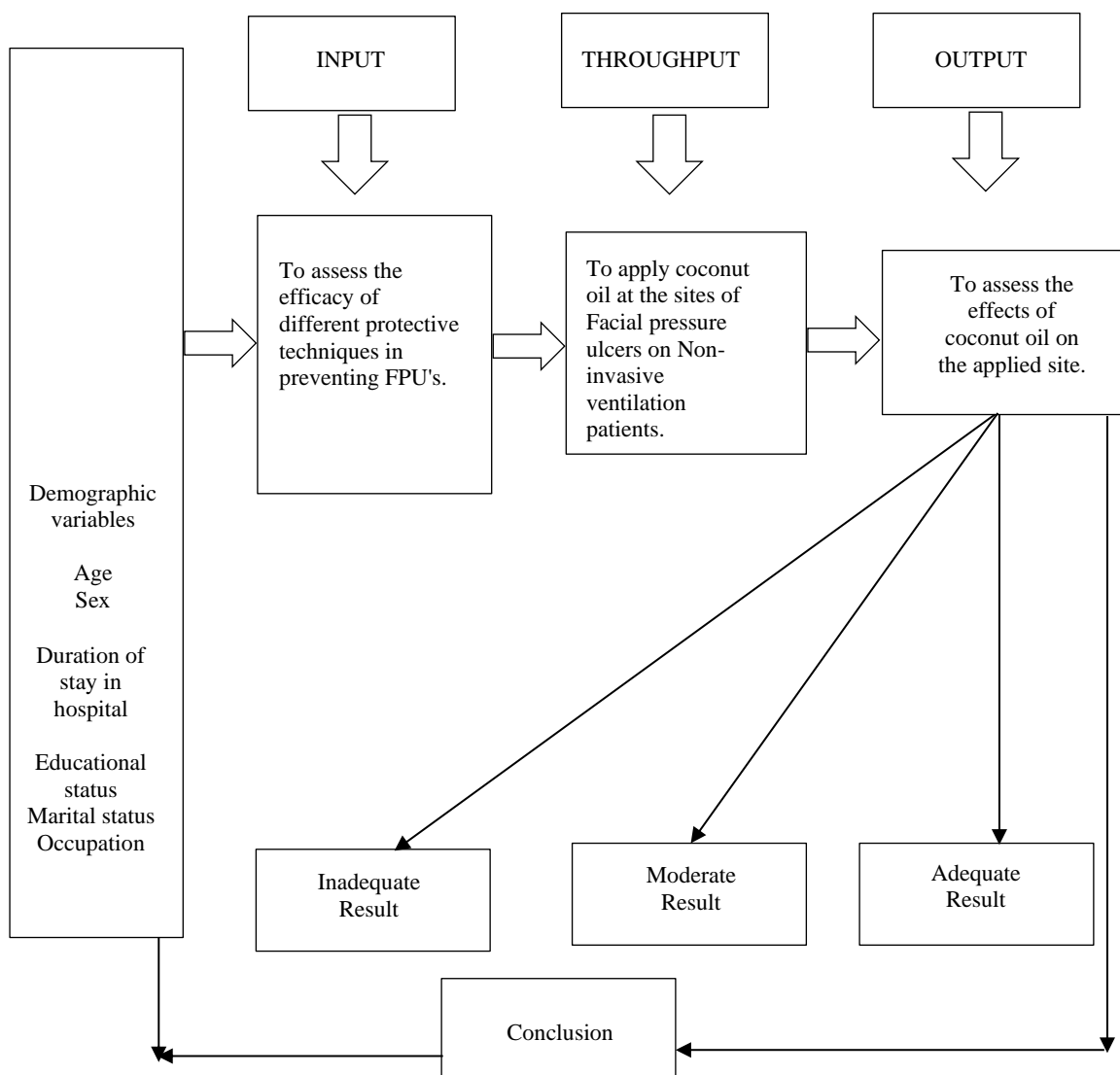


Figure 1. Conceptual framework based on general system.

REVIEW OF LITERATURE

The task of reviewing literature involves the identification of a selection of critical analysis and reporting on the particular problem that has been chosen for the statement.

A case study was developed with early intervention, which is a critical strategy to mitigate facial pressure ulcer development. Once the risk is identified, prompt intervention is advised to prevent the formation of facial pressure ulcers. After evaluating the effectiveness of risk assessment scales and preventive strategies for patients at risk of developing facial pressure ulcers, the American College of Physicians developed clinical guidelines. Non-invasive ventilation (NIV) is a crucial treatment for managing acute respiratory failure and chronic respiratory conditions. However, NIV can result in complications, such as facial pressure ulcers (FPUs), which are influenced by the type of mask, fit, and materials used. This literature review examines current evidence on NIV usage and strategies to prevent FPUs. Paus-Jenssen *et al.* conducted a study at a tertiary care center focused on the use of NIV in acute respiratory failure [1]. They highlighted the importance of choosing the correct ventilatory interface to achieve optimal outcomes. Their findings suggested that nasal masks are generally better tolerated by patients, whereas oro-nasal masks were more effective in rapidly reducing partial pressure of carbon dioxide (pCO₂). This study underscores the need for careful selection and customization of NIV masks to improve patient tolerance and clinical outcomes. The study demonstrated that using specific

preventive measures, such as protective dressings, significantly reduced the incidence of FPU. This research highlights the importance of proactive measures in managing patients on NIV to mitigate the risk of skin complications, emphasizing the role of clinical protocols in enhancing patient care. Schallom *et al.* compared the incidence of pressure ulcers in patients using nasal-oral versus full-face NIV masks. Their findings indicated that full-face masks were associated with a higher incidence of FPU compared to nasal-oral masks. The study recommended careful consideration of mask type and fit to reduce the risk of pressure ulcers, suggesting that nasal-oral masks may be preferable for certain patient populations [4].

Raurell-Torredà *et al.* conducted a cohort study to optimize the care of patients on NIV. They explored which hospital units were best suited for managing these patients, emphasizing the importance of specialized care in preventing complications like FPU. Their findings support the establishment of dedicated NIV units or protocols to ensure high-quality care and minimize adverse outcomes [5].

Black *et al.* reviewed the incidence of medical device-related pressure ulcers, including those caused by NIV masks, in hospitalized patients. They found that medical devices are a significant source of pressure ulcers and advocated for the implementation of preventive strategies, such as regular skin assessments and the use of protective barriers. This study reinforces the need for comprehensive management plans to address the risks associated with medical devices [6].

Dellweg *et al.* studied the determinants of skin contact pressure during NIV. They identified factors such as mask fit, strap tension, and patient positioning that influence pressure distribution on the skin. Their findings highlight the importance of optimizing these factors to prevent FPU. This research provides practical guidelines for clinicians to adjust NIV settings and fit to enhance patient comfort and reduce skin complications [7, 8].

Fletcher provided an overview of device-related pressure ulcers, emphasizing the importance of appropriate device selection, regular assessment, and preventive strategies to mitigate the risk of ulcers. His review highlights the broad issue of pressure ulcers beyond NIV, stressing the need for vigilance and proactive measures in clinical practice [9].

Weng examined the effect of protective treatments in reducing pressure ulcers for NIV patients. The study found that using protective dressings and adjusting mask fit significantly decreased the incidence of pressure ulcers. This research supports the implementation of targeted interventions to enhance patient outcomes during NIV therapy [10].

Acorda discussed the collaboration between nursing and respiratory therapy in preventing BiPAP-related pressure ulcers. The study emphasized the importance of interdisciplinary approaches in managing patient care, particularly in adjusting mask fit and using protective measures. This approach highlights the need for teamwork in clinical settings to prevent complications [11].

Navalesi *et al.* assessed the physiological effects of various NIV masks in patients with chronic hypercapnic respiratory failure. Their study found variations in patient comfort and effectiveness among different mask types, underlining the importance of personalized mask selection based on patient-specific needs and conditions [12].

Chai *et al.* conducted a systematic review of continuous positive airway pressure (CPAP) delivery interfaces for obstructive sleep apnea, which includes NIV masks. They discovered that choosing the right interface plays a significant role in patient compliance and comfort, which is essential for the long-term effectiveness of the therapy [13].

RESEARCH METHODOLOGY

The authors describe research methodology as "the plan or framework through which the researcher outlines an approach to identifying or solving problems (Figure 2).

Methodology is the overall framework of the research study, encompassing the sample size and selection methods, the procedures and techniques used for data collection, and the approach to data analysis. This section outlines the methodology used in this study to evaluate the effectiveness of protective measures for facial pressure ulcers in patients receiving non-invasive mechanical ventilation in the PCCM department at Pt. B.D. Sharma, PGIMS, Rohtak.

The research methodology provides a general framework for structuring the process of collecting valid and reliable data for research. It is a science of studying how research is done systematically and scientifically, so, the methodology is a significant part of research under which the researcher can protect a blue print of the research undertaken. This part deals with the description of various steps undertaken, which include the research approach, research design, research setting, target population, sample and sampling technique, criteria for sample selection, development and description of the tool, content validity of tool, reliability of tool, pilot study, data collection procedure, difficulties faced by the investigator, ethical consideration, and plan of data analysis.

Research Approach

A quantitative evaluation approach was used in this study to assess the effectiveness of protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation in the PCCM department Pt. B.D. Sharma, PGIMS, Rohtak.

Research Design

A randomized control group design is selected for the study to assess the effectiveness of protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation in PCCM department Pt. B.D. Sharma, PGIMS, Rohtak.

Variables

- *Dependent Variables:* In this study, dependent variables facial pressure ulcers among patients on non-invasive mechanical ventilation in PCCM department Pt. B.D. Sharma, PGIMS, Rohtak.
- *Independent Variables:* In this study, independent variables are protective techniques.

Accessible Population

It refers to the total group of cases that meet the established criteria and are available to the researcher as the pool of subjects or objects. In this study, the accessible population will be an age group of more than 18 years or older.

Sample and Size

A sample is the subset of the population selected to participate in the research study, the patients admitted under non-invasive mechanical ventilation in PCCM ICU, Pt. B.D. Sharma, PGIMS, Rohtak. The total sample size was 60.

Sampling Technique

Sampling is an important step in the research process. It is the process to selecting representative units of subset on population of the study. A purposive sampling technique was used for this study.

Criteria for Selection of Samples

Inclusion Criteria

- Patient of more than 18 years.
- Patients of both genders.
- Patients who were cooperative.
- Absence of facial soft tissue injury.

Exclusion Criteria

- Patients with facial soft tissue injury.
- Patients who have not agreed to sign consent.
- Patient with any deformity of facial anatomy.

Description of Tools

The research tool was developed by doing extensive literature reviews; the primary and secondary source of literature were used to develop an appropriate tool. The tool consists of two sections:

Section I: Demographic Data

The demographic data consists of code no., name, age, sex, birth, qualification and subject handling.

Section II: Skin Assessment Tool

It was a self-structured tool which is approved by the five researchers, which may get standardized.

Scoring Criteria

- Normal: 1
- Redness: 2
- Swelling: 3
- Skin peeling: 4

Validity

The validity of the tool was obtained based on nursing experts and medical experts in the field of medical nursing. The tool was found to be validated and widely accepted as a standardized tool.

Reliability

The reliability of the tool in assessing the effectiveness of sensory stimulation techniques was established using the test-retest method. The rank correlation coefficient was used to calculate the reliability and was found to be $r=0.83$. It was considered reliable for preceding the study.

Pilot Study

A pilot study is a small-scale preliminary investigation similar to the main study, aimed at helping the researcher identify issues that can be addressed before the larger research project, or to give the researcher a chance to test the data collection procedures. The pilot study was conducted at PCCM, Pt B.D. Sharma, PGIMS, Rohtak, after getting permission. The investigator adopted a non-probability purposive sampling technique. A sample of 8 patients using non-invasive mechanical ventilators who fulfilled the inclusion criteria was selected. The study aimed to explain the effectiveness of protective strategies for facial pressure ulcer in patients under non-invasive mechanical ventilators.

Demographic data were gathered, and four strategies were implemented across four groups to collect clinical data. The four groups were: Group A, the Direct maskgroup; second group is Adhesive Thin Dressing (ATD), third group is Adhesive Foam Dressing (AFD) and fourth group was applied with a gel Hyper-oxygenated Fatty Acid Gel (HOFA), assessed by using Shin assessment tool. The results of the pilot study showed a favorable response. The investigator did not encounter any practical difficulties, and the tool was considered to be reliable and appropriate. Hence, the same procedure was decided upon in the main study.

Data Collection Procedure

Written permission was obtained from the patients. A self-introduction was given, and details regarding the study's nature were explained to the patients.

The selected samples were approached with a study questionnaire, and the effectiveness of protective techniques was identified. Pressure ulcer protective techniques were used.

At the end of 30 days of inducing the pressure ulcer protective techniques, the level of facial skin and tissue of the study subjects were reassessed, and the score of the Norton Scale was assessed (Table 1).

1. Time spent to assess the effectiveness of protective techniques on facial pressure was approximately 12 min.
2. Protective techniques were given and patients were encouraged. The time spent was 20 min in the morning.
3. A period of 30 days continuously given to the subjects and to continuing the protective techniques.

Data Analysis

Descriptive Statistics

1. Distribution of the sample by frequency and percentage based on the demographic variables of patients using non-invasive mechanical ventilation.
2. Mean and SD of Norton score among the patients under non-invasive mechanical ventilator.

Inferential Statistics

1. Paired t-test to assess the level of facial pressure ulcer among patients admitted under non-invasive mechanical ventilator.
2. Chi-square test to find out the association of demographic variables and protective techniques of four strategic groups among the patients admitted under non-invasive mechanical ventilation.

Protection of Human rights

Oral consent was obtained from the study sample before starting the data collection. Assurance was given and confidentiality was maintained. Patients who participated in this study were explained that they have the right to withdraw from this study at any time. There was no physical and psychological strain on the patients who participated in this study.

Ethical Consideration

Prior permission was taken from the ethical committee of the institute.

Analysis and Interpretation

This study focuses on the analysis and interpretation of data gathered during the study to evaluate the effectiveness of protective techniques for facial pressure ulcers in patients on non-invasive mechanical ventilation. The analysis aims to structure the data in a clear and understandable format. It involves statistical procedures that allow the researchers to organize, interpret, analyze, summarize, assess, and present the data in numerical form. Analysis involves categorizing, ordering, manipulating, and summarizing the data to obtain answers to research questions. The purpose of analysis is to present the data in a clear form so that various research problems can be studied and tested. Both descriptive and inferential statistics were used to analyze the data, which was processed using SPSS software.

OBJECTIVES OF THE STUDY

1. To evaluate the effectiveness of various therapeutic strategies in preventing the formation of facial pressure ulcers (FPU) associated with the use of non-invasive mechanical ventilation (NIV) with oro-nasal masks in critically ill hospitalized patients.
2. To associate the findings with selected demographic variables among patients on non-invasive mechanical ventilation in the PCCM department at Pt. BD Sharma, PGIMS, Rohtak.

Table 1. Schedules for data collection procedure.

S. No	Time	Name of the place	No. of subjects	Intervention
1	10–11 am	PCCM ICU at Pt. B.D. Sharma, PGIMS, Rohtak.	60	Applying of coconut oil at the sites of FPU.

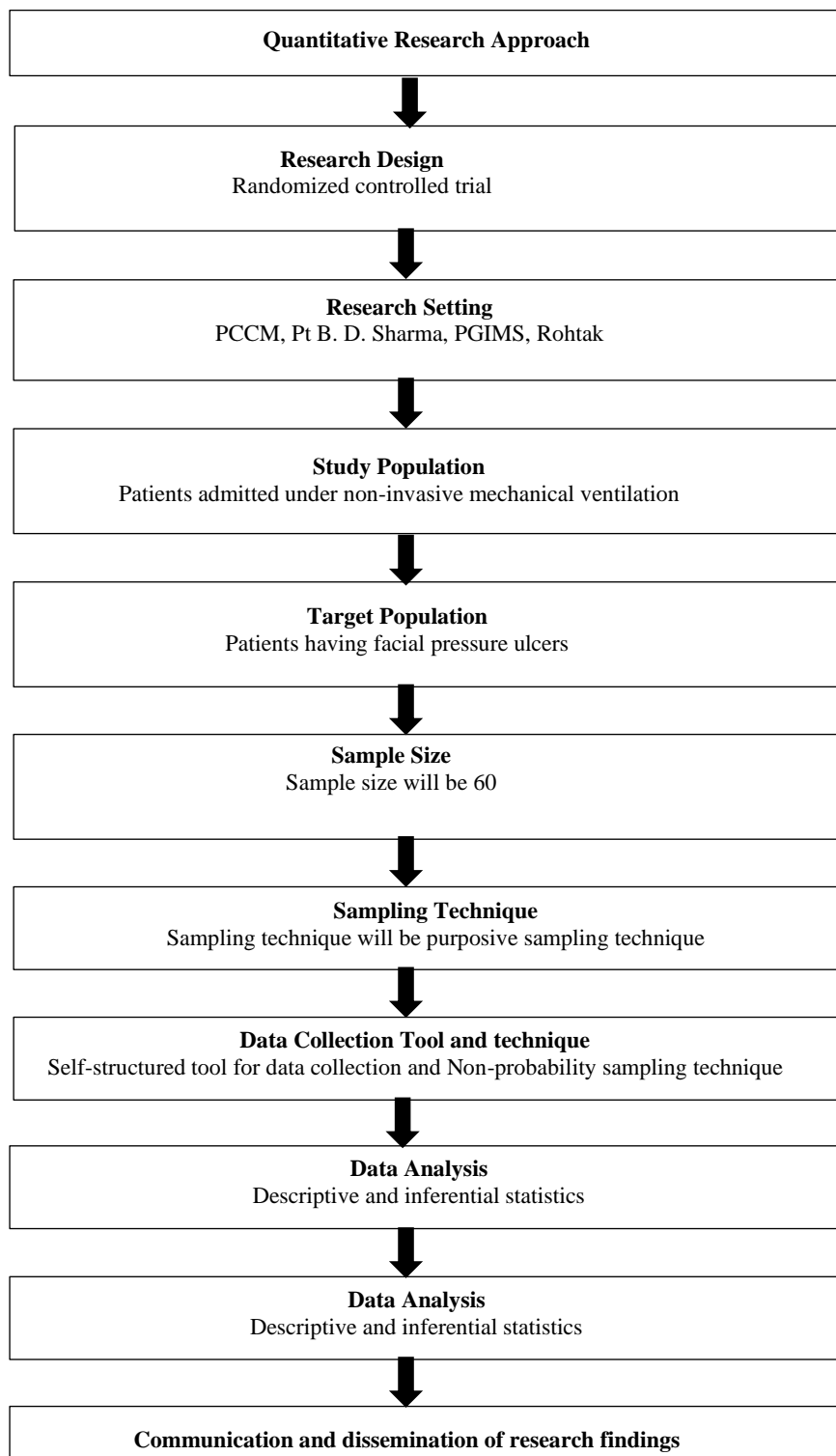


Figure 2. Schematic representation of research methodology.

ORGANIZATION OF THE STUDY FINDINGS

Raw data was collected and entered into the master sheet for statistical analysis. It was interpreted using descriptive and inferential statistics and presented in tables and diagrams. The data findings have been organized and presented under the following sections:

- *Section A:* Description of samples according to demographic characteristics by frequency and percentage.

- *Section B:* Assessing the post-test level of risk of facial pressure ulcers among the patients.
- *Section C:* Association between post-test level of facial pressure ulcer protective techniques among patients on non-invasive mechanical ventilation and selected demographic variables.

Section A: Description of samples according to demographic characteristics by frequency and percentage

Table 2 presents the distribution of demographic variables among the study participants, providing a breakdown of their characteristics in terms of frequency and percentage. It helps in understanding the profile of the patients included in the study and how these variables may relate to the effectiveness of the protective techniques used for preventing facial pressure ulcers in patients on non-invasive mechanical ventilation (Table 2).

Table 2. Frequency and percentage distribution of demographic variables.

Demographic variables	Frequency	Percentage
<i>Age</i>		
18–30 years	0	0%
31–40 years	0	0%
41–50 years	30	50%
Above 50 years	30	50%
<i>Sex</i>		
Male	23	38.3%
Female	37	61.7%
Transgender	0	0%
<i>Duration of Stay in hospital (days)</i>		
0–2 days		16.7%
3–4 days	10	73.3%
5–6 days	44	3%
More than 6 days	4	6.7%
<i>Educational status</i>		
Illiterate	1	1.7%
10+2	8	13.3%
Graduate	44	73.3%
Post Graduate	7	11.3%
<i>Occupation</i>		
Private employee	30	50%
Govt. employee	4	7%
Homemaker	21	35%
Farmer	5	8%
<i>Family monthly income (Rs.)</i>		
10–20 K	25	42%
21–30 K	15	25%
31–40 K	15	25%
Above 40 K	5	8%
<i>Area of residence</i>		
Rural	40	67%
Urban	15	25%
Slum	5	8%

In terms of age distribution, it was noted that 50% of the study subjects were in the 41–50 years age group, while the remaining 50% were over 50 years old (Figure 3).

In terms of gender distribution, it was found that 38% of the study subjects were males, while 62% were females (Figure 4).

Regarding the distribution of the population based on the duration of hospital stay, 3% of the subjects stayed for 0–2 days, 7% for 3–4 days, 73% stayed for 5–6 days, and 17% stayed for more than 6 days (Figure 5).

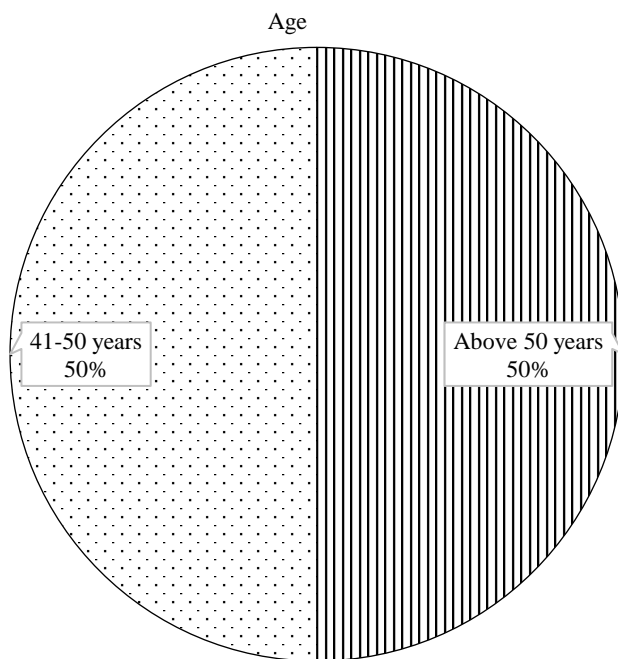


Figure 3. Distribution of population according to age.

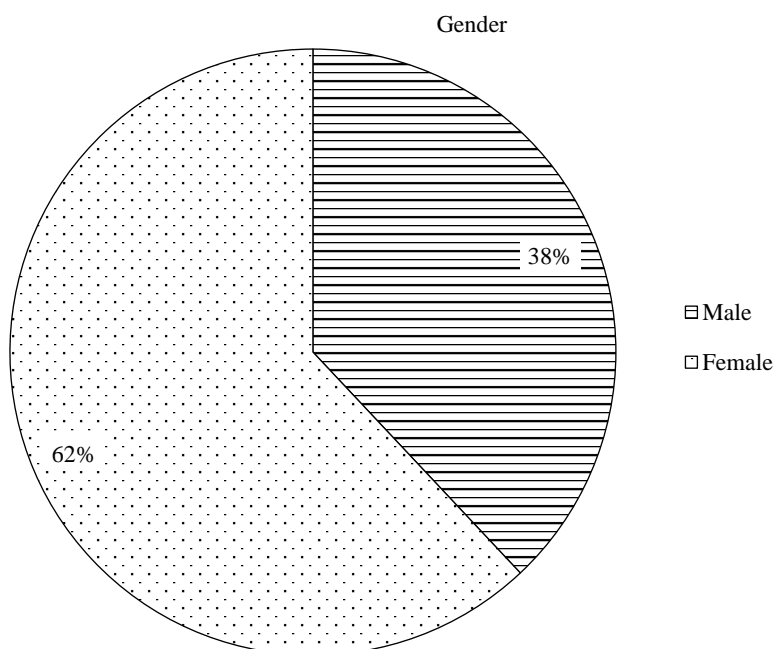


Figure 4. Distribution of population according to sex.

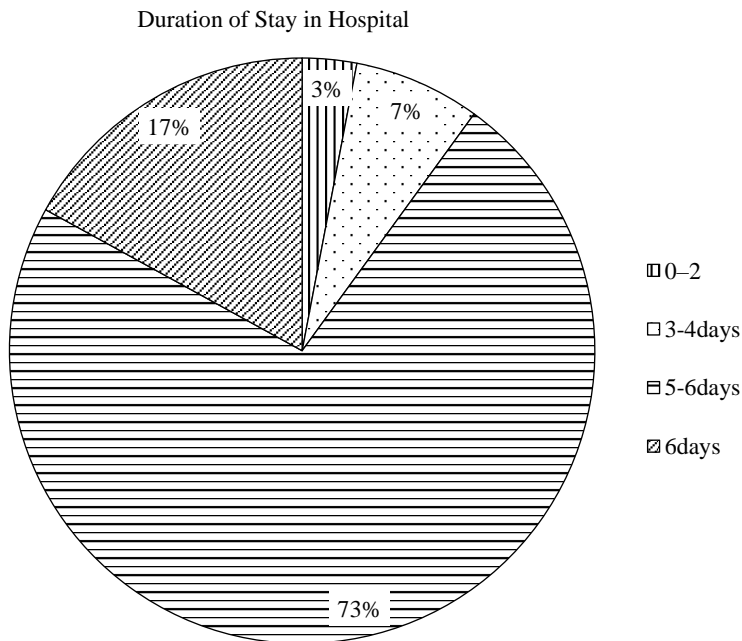


Figure 5. Distribution of population according to duration of stay in hospital.

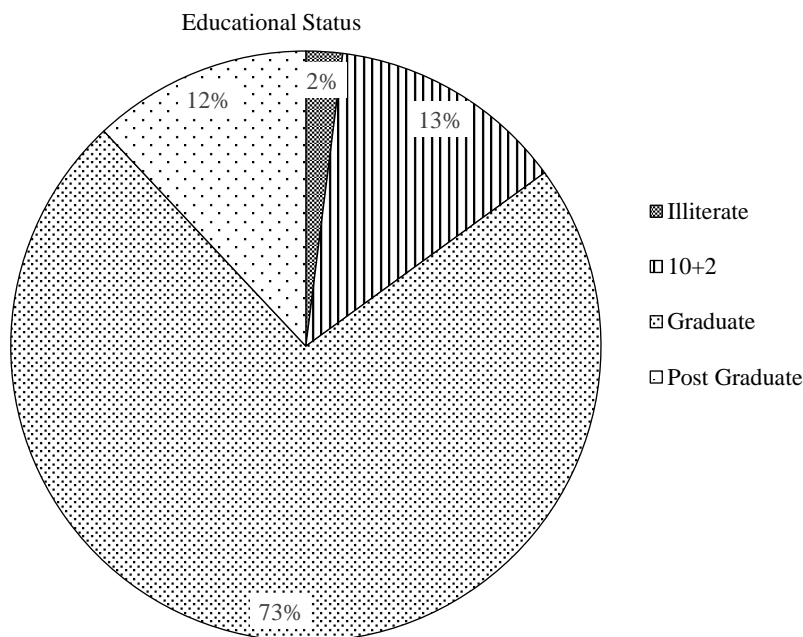


Figure 6. Distribution of population according to the education status.

In terms of education status, it was found that 2% of the study subjects were illiterate, 13% had completed up to 10+2, 73% were graduates, and 12% had completed post-graduate education (Figure 6).

In terms of occupation distribution, it was observed that 60% of the study subjects were private employees, 35% were farmers, and 5% were homemakers (Figure 7).

Regarding the distribution of the population based on family monthly income, it was observed that 50% of the study subjects earned between Rs. 21 and 31 K, while the other 50% earned more than Rs. 40 K (Figure 8).

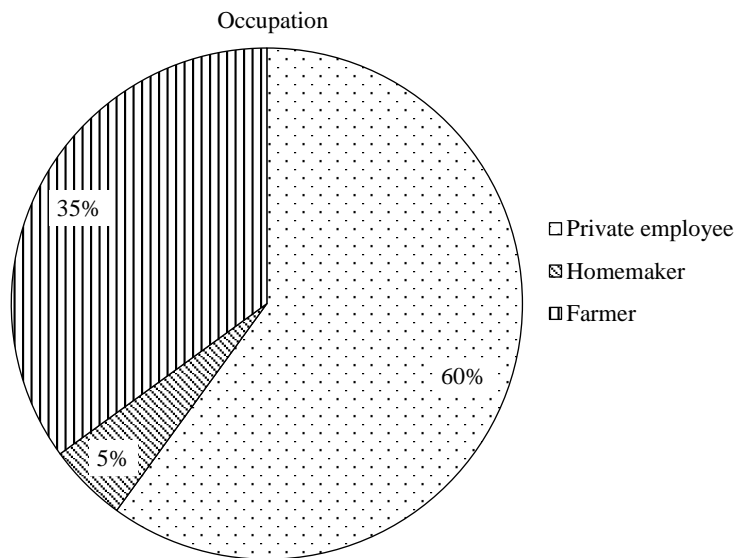


Figure 7. Distribution of the population according to occupation.

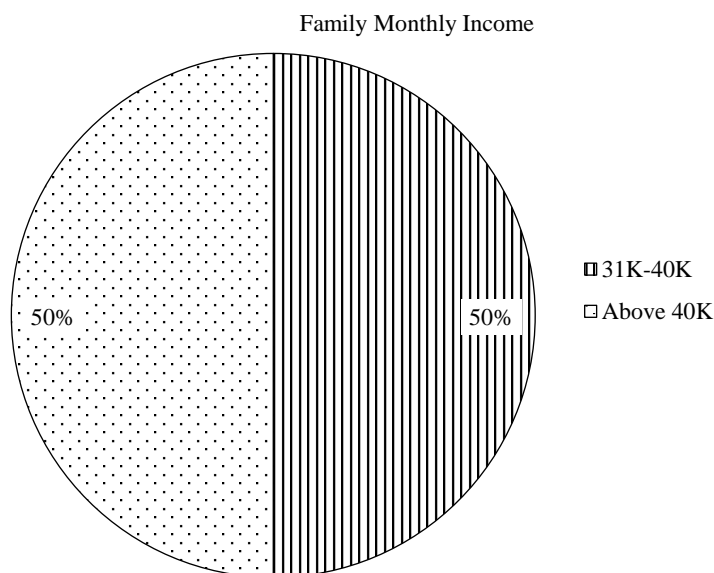


Figure 8. Distribution of population according to family monthly income.

In terms of occupation distribution, it was observed that 50% of the study subjects resided in rural areas, 25% lived in slum areas, and 25% resided in urban areas (Figure 9).

Section B: Description of samples to: Assess the post-test level of risk of facial pressure ulcers among the patients with NIV

The Table 3 presents a comparison of post-test scores between the experimental group and the control group, each comprising 30 patients. The scores are classified into four risk categories: Very High Risk, High Risk, Medium Risk, and Low Risk.

Experimental Group (n=30)

- *Very High Risk:* 2 patients (6.67%)
- *High Risk:* 6 patients (20.00%)
- *Medium Risk:* 9 patients (30.00%)
- *Low Risk:* 13 patients (43.33%)

In the experimental group, most patients (43.33%) are categorized as Low Risk. A significant portion (30.00%) falls into the Medium Risk category, while 20.00% are classified as High Risk. Only a small percentage (6.67%) of patients fall into the Very High Risk category.

Control Group (n=30)

- *Very High Risk:* 10 patients (33.33%)
- *High Risk:* 13 patients (43.33%)
- *Medium Risk:* 4 patients (13.33%)
- *Low Risk:* 3 patients (10.00%)

In the control group, a significant portion of patients (43.33%) are in the High Risk category, followed by 33.33% in the Very High Risk category. The Medium Risk category comprises 13.33% of the patients, and only a small percentage (10.00%) are in the Low Risk category.

Comparative Analysis

Very High Risk

The control group has a significantly higher percentage of patients in the Very High Risk category (33.33%) compared to the experimental group (6.67%).

Table 3. Assess the post-test level of risk for facial pressure ulcers among patients on non-invasive ventilation (NIV).

Score Interpretation	Experimental group n=30		Control group n=30	
	<i>Post test</i>		<i>Post test</i>	
	<i>f</i>	<i>%</i>	<i>F</i>	<i>%</i>
Very High Risk	2	6.67	10	33.33
High Risk	6	20.0	13	43.33
Medium Risk	9	30.0	4	13.33
Low Risk	13	43.3	3	10.00

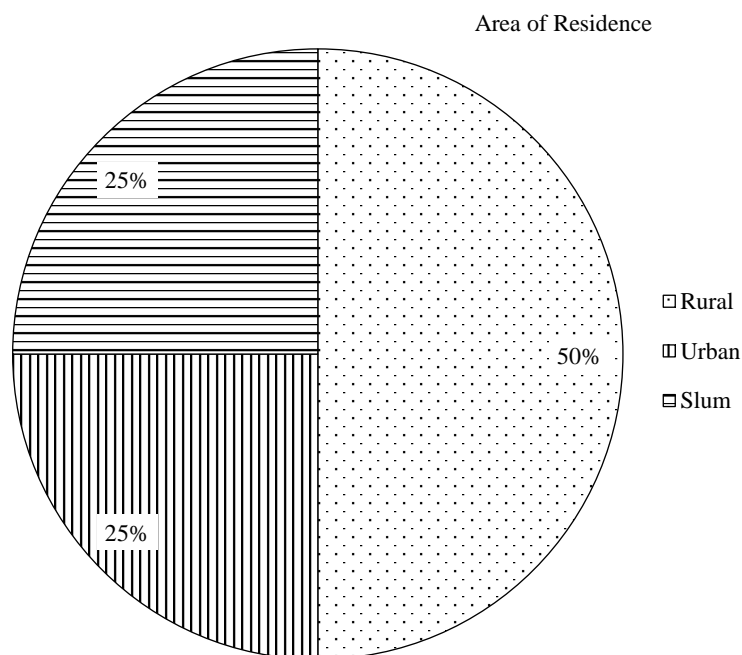


Figure 9. Distribution of population according to area of residence.

High Risk

The control group also has a higher percentage of patients in the High Risk category (43.33%) compared to the experimental group (20.00%).

Medium Risk

Conversely, the experimental group has a higher percentage of patients in the Medium Risk category (30.00%) compared to the control group (13.33%).

Low Risk

The experimental group shows a significantly higher percentage of patients in the Low Risk category (43.33%) compared to the control group (10.00%). The data suggests that the intervention or treatment applied to the experimental group was effective in reducing the number of patients in the higher risk categories (Very High Risk and High Risk) and increasing the number in the lower risk categories (Medium Risk and Low Risk). In contrast, the control group had a higher proportion of patients remaining in the higher risk categories. This indicates a positive impact of the experimental conditions on reducing overall risk levels among patients (Figures 10 and 11).

The Tables 4–6 present the results of a hypothesis test comparing the proportions of patients at very high risk between the experimental group and the control group. The null and alternative hypotheses are as follows:

- $H_o: p_1=p_2$ (The proportion of patients at very high risk is the same in both groups).
- $H_a: p_1<p_2$ (The proportion of patients at very high risk in the experimental group is less than that in the control group).

The test results show a statistically significant difference between the proportions of patients at very high risk in the experimental group and the control group.

P-Value

The p-value of 0.010 is smaller than the typical significance level of 0.05, indicating that we reject the null hypothesis in favor of the alternative hypothesis. In other words, there is sufficient evidence to conclude that the proportion of patients at very high risk in the experimental group is significantly lower than that in the control group.

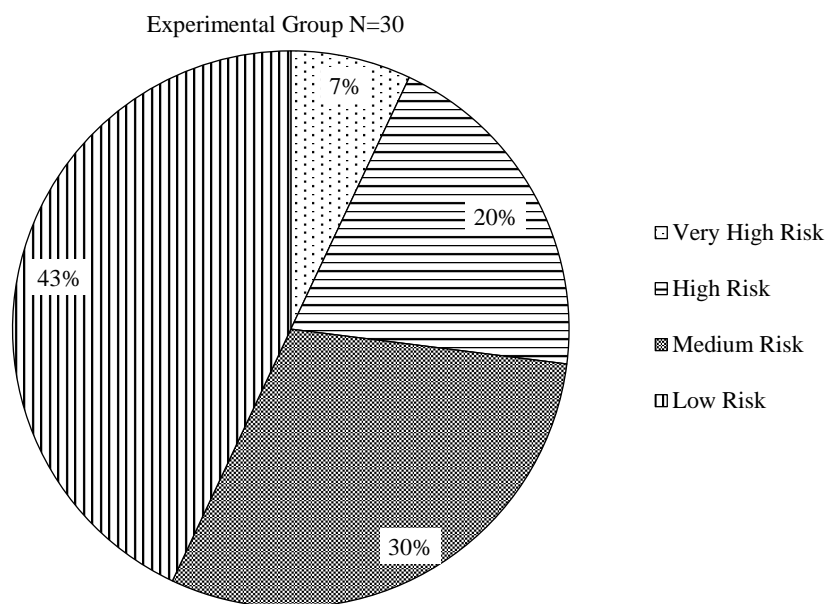


Figure 10. Post level of experimental group.

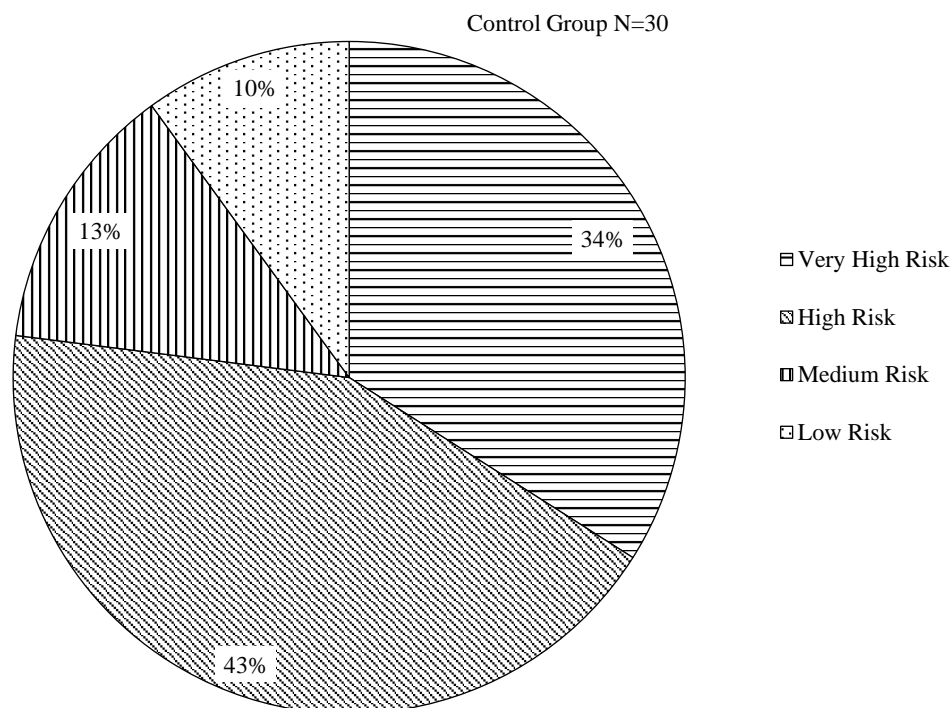


Figure 11. Post test level of control group.

Table 4. Descriptive Statistics.

Sample	N	Event	Sample p
Experimental	30	2	0.066667
Control	30	10	0.333333

Table 5. Hypothesis testing.

Hypothesis	Null Hypothesis (H ₀)	Alternative Hypothesis (H ₁)
Hypothesis Statement	$p_1 - p_1 = 0$	$p_1 - p_2 \neq 0$

Table 6. P-value.

Method	Z-Value	P-Value
Normal Approximation	-2.58	0.010

Section C: Description of samples according to Association between post-test level of protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation and selected demographic variables

Table 7 shows a significant association between post-test level official pressure ulcers and demographic variables.

Chi-square was used to determine the association of the post-test level of facial pressure ulcer with demographic variables. Family monthly income, occupation and area of residence were found to be statistically significant (p-value <0.05). The association was found with age, sex, duration of hospital stay, and educational status, which were not significant at the 0.01 significance level.

Hence, the present study identified that the post-test level of facial pressure ulcers is significantly associated with demographic variables.

Table 7. Association between post-test level of protective techniques of facial pressure ulcer among patients on non-invasive mechanical ventilation and selected demographic variables.

Demographic	Very High	High	Medium	Low	Chi-		p
Variable	Risk	Risk	Risk	Risk	Square		value
<i>Age</i>							
18–30 years	2	4	2	2			
31–40 years	2	14	8	2	1.4	4	8.6
41–50 years	4	10	10	4			
Above 50 years	4	10	10	4			
<i>Sex</i>							
Male	6	24	18	6	0.5	2	31.5
Female	2	4	6	2			
Transgender		4				4	
<i>Duration of stay in hospital (days)</i>							
0–2	4	20	18	4	1.1		3.84
3–4	2	8	4	2			
5–6	2	8	4				
More than 6 days	2	4	6	2			
<i>Educational Status</i>							
Illiterate	2	22	20	2		2	
10+2	4	6	4	4	0.5		31.5
Graduate	2	22	20	2			
Post Graduate	4	6	4	4			
<i>Occupation</i>							
Private employee	4	8	20	4		4	
Govt. employee	2	10	4	2	8.9		8.6
Homemaker	2	10	-	2			
Farmer	4	8	20	4			
<i>Family monthly income (Rs.)</i>							
10–20 K	2	6	4	2		4	
21–30 K	2	6	4	2	7.8		8.6
31–41 K	2	10	6	2			
Above 40 K	2	6	10	2			
<i>Area of Residence</i>							
Rural	2	22	20	2		4	
Urban	4	4	2	4	8.1		8.6
Slum	2	2	2	2			

DISCUSSION

This section examines the findings of the study. In the discussion section, the researcher interprets the significance and implications of the results. This section aims to explain the meaning of the outcomes. The core of any research project is in presenting its findings. This section includes a summary, conclusion, implications for nursing practice, recommendations, and the study's limitations.

This section presents the discussion of findings based on samples as per their demographic characteristics, post-test level of risk of facial pressure ulcers and association between post-test level of protective techniques of facial pressure ulcers.

In order to achieve the objectives of the study, standardized questionnaires were distributed to facial pressure ulcer clients in PCCM department, PGIMS, Rohtak. The pilot study was carried out among

four samples and the main data was collected among 60 subjects; those who fulfilled the inclusion criteria were selected by purposive sampling. Demographic variables, NORTON tool assessed the samples. The collected data was organized and analyzed using statistical software (SPSS Version 20). Descriptive and inferential statistics was used for the analysis of the data. The results of the study were discussed according to the objectives of the study.

The study aims to assess the effectiveness of protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation in the PCCM department at Pt. B.D. Sharma, PGIMS, Rohtak. The findings are discussed under the following sections:

- *Section A:* Description of samples according to demographic characteristics by frequency and percentage.
- *Section B:* Assessing the post-test level of risk of facial pressure ulcers among the patients with NIV.
- *Section C:* Association between post-test level of protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation and selected demographic variables.
- *Section D:* Discussion related to testing of the hypothesis.

Section A: Description of samples according to demographic characteristics by frequency and percentage

With regards to age distribution, it was observed that out of 4 subjects, the study subjects in the age group of 41–50 years were 50%, and 50% were in age group of above 50 years.

Section B: Assessing the post-test level of risk of facial pressure ulcers among the patients with NIV

The post-test scores of both groups showed that in the experimental group, 50% (15) of the samples were at very high risk, 26.6% (8) were at high risk, and 24.5% (7) were at medium risk. In contrast, in the control group, 24.5% (7) of the samples were at high risk, 50% (15) were at medium risk, and 26.5% (8) were at low risk.

Section C: Association between post-test level of protective techniques of facial pressure ulcers among patient on non-invasive mechanical ventilation and selected demographic variables

There is a significant association between the post-test level of facial pressure ulcers and demographic variables. Chi-square analysis was used to determine the association between the post-test level of facial pressure ulcers and demographic variables. Family monthly income, occupation, and area of residence were found to be statistically significant (p -value < 0.05). In contrast, no significant association was found with age, sex, duration of hospital stay, and educational status at the 0.01 level of significance. Therefore, the present study identified that the post-test level of facial pressure ulcers is significantly associated with certain demographic variables.

Section D: Discussion related to testing of the hypothesis

- *Research hypothesis:* There will be a significant association between the protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation and demographic variables at 0.05 level of significance.
- *Null hypothesis:* There will be no significant association between the protective techniques of facial pressure ulcer among patients on non-invasive mechanical ventilation and demographic variables at 0.05 level of significance.
- *Study findings:* Chi-square test revealed that there was a significant relation between the protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation and demographic variables.

SUMMARY

The primary goal of the study is to evaluate the effectiveness of various therapeutic strategies in preventing the formation of facial pressure ulcers (FPU) associated with the use of non-invasive mechanical ventilation (NIV) and oro-nasal masks in critically ill hospitalized patients.

The present study was conducted with the following significant results:

- 50% of the patients were between the age of 41 and 50 years, 50% of patients were in the age group of above 50 years.
- The majority of patients were females (62%).
- The majority of patients were graduates (73%).
- The majority of patients were living in rural areas (50%).
- Subjects were having equal income % between Rs. 21 and 31 K (50%) and more than Rs. 40 K (50%)
- The majority of patients stayed for 3–4 days in hospital (73%).
- The present study found a statistically significant association of family monthly income, occupation and area of residence.
- The test results indicate that there is a statistically significant difference between the proportions of patients at very high risk in the experimental group and the control group.
- P-Value: The p-value of 0.010 is less than the common significance level of 0.05. This means we reject the null hypothesis in favor of the alternative hypothesis. In other words, there is sufficient evidence to conclude that the proportion of patients at very high risk in the experimental group is significantly lower than in the control group. A chi-square test was applied to determine the association of post-test level of protective techniques of facial pressure ulcers with demographics, which revealed a significant relation between the protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation and demographic variables.

Interpretation of Hypothesis

- *Research hypothesis:* There will be a significant association between the protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation and demographic variables at 0.05 level of significance.
- *Null hypothesis:* There will be no significant association between the protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation and demographic variables at 0.05 level of significance.
- *Study findings:* The chi-square test revealed that there was a significant relation between the protective techniques of facial pressure ulcers among patients on non-invasive mechanical ventilation and demographic variables.

Hence, the Research hypothesis is accepted.

IMPLICATIONS

The study has the following implications in nursing for nursing services, nursing administration, nursing education and nursing research.

Nursing Service

- The study findings revealed that nurses play an important role in providing care and protecting facial pressure ulcers in patients with non-invasive mechanical ventilation.
- The study findings indicate the benefits of protective techniques for facial pressure ulcers in patients on non-invasive mechanical ventilation.
- Understand the importance of facial pressure ulcer protective techniques as an adjuvant to non-pharmacologic therapy.
- The healthcare team members are encouraged to teach their patients what will benefit their health.

Nursing Education

- Encourage the students to learn about the techniques and benefits of techniques.
- Nurse educators should emphasize the involvement of protective techniques in the management of bedridden problems.
- Nurse educators must educate the students and staff regarding various protective techniques that can be implemented for the care of the patients on non-invasive ventilation.

Nursing Administration

- The administrators have the highest responsibility in helping and providing nurses with a substantive continuing nursing education program, as this will enable nurses to update their knowledge and acquire special skills in managing patients with pressure ulcer problems.
- The administrators can encourage the nurses to use different safe, cost-effective protective techniques among patients on non-invasive ventilation.
- Provide opportunities for nurses to attend in-service education regarding complimentary protective therapies.
- Initiate measures for the introduction of protective techniques as a form of physical therapy in various settings.

Nursing Research

- As evident from the review of the literature, further research needs to be conducted to support the effectiveness of protective techniques on patients with facial pressure ulcers on non-invasive ventilation. There is a need for extensive and intensive research in this area to generate a more specific database and to identify the benefits of the therapies and provide much-needed information for the providers and the consumers.
- More research studies can be conducted to check the effectiveness of protective techniques on various facial pressure ulcers.
- Disseminate the findings through conferences, seminars, publications in professional, national, and international journals and the world web.

Recommendations

- The same study can be conducted on a large sample for better generalization.
- A similar study can be conducted on a long-term basis, a longitudinal study.
- A similar study can be conducted for the effectiveness of protective techniques in different settings for different patients.

This study can be done as a comparative study in different settings.

Limitations

The limitations of the study were:

- Since the sample size was 60, the findings should be cautiously generalized.
- The study setting was chosen due to the availability of patients, and it was not a random selection. Due to methodological limitations, the findings should be generalized only to the selected special hospital.

CONCLUSION

The study reveals the effectiveness of protective techniques for preventing pressure ulcers in patients on non-invasive mechanical ventilation. The difference was statistically significant at $p < 0.001$, indicating its effectiveness.

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