IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A DESCRIPTIVE STUDY TO IDENTIFY THE INCIDENCE AND FACTORS CONTRIBUTING TO 'NON- INVASIVE VENTILATION ASSOCIATED SKIN INJURY (NASI)' IN PATIENTS ON NON-INVASIVE VENTILATOR ADMITTED IN SELECTED HOSPITALS IN A METROPOLITAN CITY WITH A VIEW TO DEVELOP THE NON- INVASIVE VENTILATION CARE BUNDLE.

[1]Ms. Mahati Sanjay Sable

[1]Staff Nurse

[1]Sir H.N. Reliance Hospital, Mumbai, India

Abstract:

Background: The utilization of non-invasive ventilation (NIV) for both acute and chronic impaired gas exchange is a common clinical practice. The non-invasive mechanical ventilation represents an effective strategy to prevent endotracheal intubation and has become an integral tool in the management of patients with the acute and chronic respiratory failure. One of the important complications of non-invasive ventilation is skin lesions or pressure ulcer. A medical device related pressure ulcer is defined as a localized injury to the skin or underlying tissue as a result of the sustained pressure from a medical device. Aim and objective: A study was planned to identify the incidence and factors contributing to 'non- invasive ventilation associated skin injury (NASI)' in patients on non-invasive ventilator admitted in selected hospitals in a metropolitan city with a view to develop the non- invasive ventilation care bundle, and to develop and validate the non- invasive ventilation care bundle. Material and method: A descriptive study was conducted with the primary objective to identify incidence andfactors contributing to non-invasive ventilation associated skin injury in patients on non-invasive ventilator admitted in intensive care units. It was quantitative descriptivestudy in which survey research design was used. A non-probability purposive samplingtechnique was used to enroll total 150 patients on non-invasive ventilator. The data wascollected by using self-structured tool with observational method. Results: Highfrequency factors contributing to NIV associated skin injury are Oronasal mask,continuous duration and CPAP mode, Repeated adjustment of mask, absence of skin barrier, Once a shift skin assessment, discomfort to NIV. There is significant association between factors such as type of mask, duration of NIV, mask fixation technique, skin barrier, co-morbidity, skin type, dietary pattern, fluid status, compliance, comfort and demographic variables such as age and previous experience of NIV with degrees of 'NASI'. Conclusion:

The research study was conducted by the investigator with the purpose of identificationof incidence of NASI, factors contributing to the same and developing NIV care bundle.Incidence of NASI findings in this study was 47.4%, investigator able to identify the high frequency factors contributing to NIV associated skin injury. On the basis of findings of an analysis, Investigator develop NIV care bundle as a preventive practice to reduce the incidence and factors contributing to NIV associated skin injury.

Index Terms **- Incidence, Non Invasive ventilation, Hospital, Metropolitan City, Ventilation**.

I. INTRODUCTION

Non-invasive ventilation is the use of breathing support through a mask which is tightlyfitted to the face or around the head, but without need for intubation. However, there are potential problems with its clinical application and development of NIV related skininjury represents a common complication. Non-invasive ventilation has been associatedwith development of skin injury with rates from 10 to 31%. Many factors contribute tothe development of a skin injury and such factors are varied from patient to patient. As quoted by Virginia Burden, all the body systems are equally important to runthe human body as a healthy vehicle. Treating one body system and neglecting anotheris not right way of providing care and treatment to the sick. The clinical goal of the NIVutilization should be that to

maintain the gas exchange with the prevention of its side effects such as the pressure skin injury. There are some risk factors leading to the device related skin injury. Preventionand the management of such factors can control the NIV related skin injury.

II. BACKGROUND OF THE STUDY

The utilization of non-invasive ventilation (NIV) for both acute and chronic impaired gas exchange is a common clinical practice. The non-invasive mechanical ventilation represents an effective strategy to prevent endotracheal intubation and has become an integral tool in the management of patients with the acute and chronic respiratory failure. One of the important complications of non-invasive ventilation is skin lesions or pressure ulcer. A medical device related pressure ulcer is defined as a localized injury to the skin or underlying tissue as a result of the sustained pressure from a medical device. Black mentions in an article published in the journal of Advances in Skin & Wound Care, that the greatest risk for a NIV-related pressure injury is during the acutephase of therapy which requires continuous mask application to optimize the gas exchange. The injury can occur at any point on the face where any part of the mask meets the surface of the skin. The patients on NIV admitted in the intensive care units are mostly experienced injury across the nasal bridge. The skin across the nasal bridgeis different, in that the third layer of skin is absent. Thus, the depth from skin surface tobone is minimal and the risk for rapid injury evolution is significant

Statement of Problem:
A descriptive study to identify the incidence and factors contributing to 'non- invasive ventilation associated skin injury (NASI)' in patients on non-invasive ventilator admitted in selected hospitals in a metropolitan city with a view to develop the non- invasive ventilation care bundle.

Objectives of study:

1.To identify the incidence and factors contributing to non-invasive ventilation associatedskin injury among patients on the non-invasive ventilator.

2. To associate the degrees of non-invasive ventilation associated skin injury (NASI) with selected factors and demographic variables.

Delimitations:
1.The study is delimited to the patients on the non-invasive ventilator admitted inIntensive care units.
2.The data collection is delimited for a stipulated period.
3.The study is delimited to the conscious patients on the NIV.

III. Research Methodology:

A descriptive study was conducted with the primary objective to identify incidence andfactors contributing to non-invasive ventilation associated skin injury in patients on non-invasive ventilator admitted in intensive care units. It was quantitative descriptivestudy in which survey research design was used. A non-probability purposive sampling technique was used to enroll total 150 patients on non-invasive ventilator. The data was collected by using self-structured tool with observational method. Frequency andpercentage were used for analysis and interpretation of demographic data, Major symptoms, Minor symptoms, Incidence of non-invasive ventilation associated skin injury and High frequency factors contributing to NIV associated skin injury. Chi square test was used to determine association of degrees of NASI with selected factorsand demographic variables.

3.1 Population and Sample:

The study was conducted among the 150 patients on non-invasive ventilator.

3.2 Data and Sources of Data

The data was collected by using self-structured tool with observational method. A non-probability purposive sampling technique was used.

3.3 Theoretical framework

The one end represents high wellness (health) i.e. healthy skin of patients on theNIV whereas, the other end represents low level wellness (illness) i.e.in this study: "non-invasive ventilation associated skin injury". There are many factors contributing to "non-invasive ventilation associated skininjury" and these factors need to be controlled and treated by using some preventive strategies to gain an optimum health such factors are observed factors and perceived factors. When these risk factors are well balanced and effectively maintained, there areno signs and symptoms of illness.

IV. Results and Discussion

Table 4.1: Distribution of subjects according to age andgender

N=150

SN	Demographic Data	F	%
A	**Gender**		
1	Female	66	44%
2	male	84	56%
B	**Age Group (Years)**		
1	18 – 38	31	21%
2	39 – 58	56	37%
3	59 – 78	43	29%
4	>79	20	13%

Table 4.1 depicts the distribution of subjects in relation to their age and gender. It reveals that Total subjects in the study were **Men** constituting 84 subjects (56%) whereas Females were 66 (44%). With regards to age, maximum subjects (37%) are inthe age group of **39-58 years**, whereas Minimum 20 subjects (13%) are from the age group of >79 years. Total 31 Subjects (21%) belong to the age group of 18-38 years and 43 subjects (29%) belongs to age group of 59-78 years.

TABLE 4.2: Distribution of subjects according to previous experience of non-invasive ventilation

N=150

SN	Previous experience of NIV	F	%
1	No	115	76.7%
2	Yes	35	23.3%

Table 4.2 depicts distribution of subjects according to previous experience ofNon-invasive ventilation. 35 (23.3%) had experience of non-invasive ventilation while115 (76.7%) did not have any experience of non-invasive ventilation. This distributionshows that maximum subjects did not have previous NIV experience, that can lead to less compliance and adjustment to non-invasive ventilation causing skin injury.

TABLE 4.3: Distribution of subjects according to majorsymptoms

N=150

SN	MAJOR SYMPTOMS	Absent		Present	
		F	%	F	%
1	Epidermalabrasion	142	94.7%	8	5.33%
2	Bleeding	96	64%	54	36%
3	Subcutaneoustissue damage	110	73.3%	40	26.67%
4	Open/rupturedblister	123	82%	27	18%

Table 4.3 depicts distribution of subjects according to presence and absence of major symptoms. Among all symptom's majority of subjects 54 (36%) presented withBleeding while 96 subjects had no episodes of bleeding, suggesting **Bleeding** is the commonest major symptom experienced by subjects. Subjects presented with Epidermal abrasion were 8 (5.33%) while 142 (94.7%) subjects had no epidermal abrasion. 40 subjects (26.67%) presented with subcutaneous tissue damage while 110 (73.3%) did not with the same. 27 subjects (18%) presented with open/ruptured blisterswhile 123 (82%) are not with the same.

FIGURE 4.1 Distribution of subjects according to major symptoms

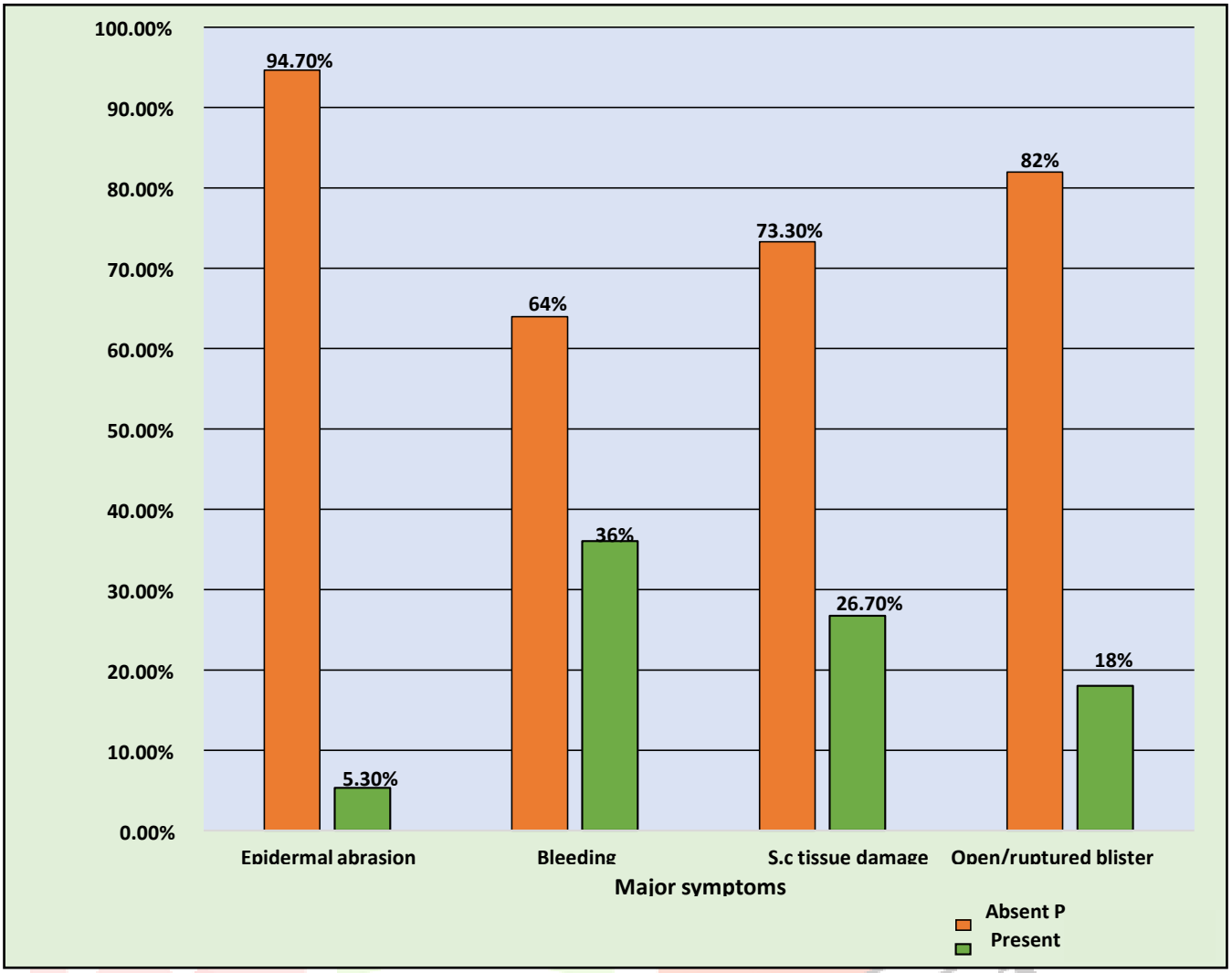

Figure No. 4.1 Depicts distribution of subjects according to presence and absence ofMinor Symptoms. With regard to skin blanching, 59 subjects (39.33%) presented withNon-blanchable redness while 91 subjects (60.67%) did not present with the same. Among all subjects, the majority of subjects 125 (83.33%) presented with **Pain**, suggesting pain is the most common symptom experienced at the site of NIV application. 103 subjects (68.67%) presented with Irritation while 47 did not present with the same. 59 subjects (39.33%) presented with Gastric insufflation while 91 subjects did not present with the same.

Table 4.4: Distribution of subjects according to incidenceand degree of 'NASI'
Following table deals with the degree of 'NASI' based on the following criteria.

1. **Degree 1**: 1 Major + 3 Minor
2. **Degree 2**: 2 Major + 2 Minor
3. **Degree 3**: 3 Major + 1 Minor
4. **Risk for 'NASI'**: Only minor symptoms (Will not be graded but for Riskidentification).
   N = Total sample screened for 'Non-invasive ventilator associated skin injury' (NASI):150
   n = Number of sample presented with 'Non-invasive ventilator associated skininjury'/Incidence of 'NASI': 71

SN	PARTICULAR	F	%
a)	**Incidence**		**N** = 150
1	'NASI' Present	71	47.4%
2	'NASI' Absent (Risk for 'NASI')	79	52.7%
b)	**Degree of 'NASI'**		**n** = 71
1	Degree 1	29	19.3%
2	Degree 2	26	17.3%
3	Degree 3	16	10.7%

Table 4.4 depicts Incidence of 'Non-invasive ventilation associated skin injury'. With regards to incidence, out of a total 150 subjects screened, 71 (47.4%) of subjects presented with confirmed 'NASI' with varying degrees and 79 subjects (52.7%) were found to be at Risk for 'NASI'. Subjects with 'NASI' are further classified according to the degrees. As per above findings,29 subjects (19.3%) subjects presented with degree 1 of NASI, 26 subjects (17.3%) subjects presented with degree 2 of NASI and 16 subjects (10.7%) subjects presented with degree 3 of NASI. Thus, investigators attained the objective of identifying Incidence of 'NASI' with71 subjects (47.4%) out of 150 screened for the same.

Table 4.5: Distribution of subjects according to factorsrelated to 'NIV' mode and setting

N=150

SN	PARTICULARS	f	%
a)	**Type of mask**		
1	Face Mask	40	26.7%
2	Nasal Mask	32	21.3%
3	Oronasal Mask	78	52%
b)	**Duration**		
1	Continuous	83	55.3%
2	Intermittent	67	44.7%
c)	**NIV mode**		
1	BIPAP	56	37.3%
2	CPAP	94	62.7%
d)	**IPAP/EPAP setting**		
1	None	94	62.7%
2	8:4	14	9.3%
3	10:5	15	10%
4	12:6	21	14%
5	>12:6	6	4%

Table 4.5 shows frequency and percentage of distribution of subjects according to factors related to 'NIV' mode and setting which are contributing for 'NASI'. With regards to type of mask, 78 subjects (52%) present with **oronasal mask** which is maximum whereas subjects present with nasal mask and face mask were 32 subjects (21.3%) and 40 subjects (26.7%) respectively. Similarly, with regards to duration, Maximum subjects were on 'NIV' **continuously** (>24 hours) i.e. 83 (55.3%) while remaining 67 subjects (44.7%) were on 'NIV' intermittently (4 hours without interruption). Those subjects on CPAP mode were 94 (62.7%), while 37.3% of subjects were on BIPAP mode. Considering setting of 'NIV' i.e. Majority of subjects were not in any setting as they were on CPAP mode while remaining subjects were 9.3%, 10%, 14% and 4% were onIPAP/EPAP setting 8:4, 10:5, 12:6 and >12:6 respectively.

TABLE 4.6: Distribution of subjects according to factorsrelated to 'assessment and compliance

N=150

SN	PARTICULARS	f	%
a)	**Frequency of Assessment**		
1	Once a Shift	84	56%
2	Twice a Shift	26	17.3%
3	As per necessity	40	26.7%
b)	**Compliance**		
1	Intolerance	77	51.3%
2	Keep mask > 4 hours	73	48.7%
c)	**Comfort (based on Pt. response)**		
1	Comfort	67	44.7%
2	Discomfort	83	55.3%

Table 4.6 depicts frequency and percentage of distribution of subjects according to factors related to assessment and compliance. 84 subjects (56%) were assessed **once ashift**, 40 subjects were assessed as per necessity and only 26 subjects were assessed twice a shift. While considering compliance of the subjects to 'NIV', only 73 subjects (48.7%) subjects kept mask for more than 4 hours while 77 subjects (51.3%) of subjects were **intolerant** to 'NIV'. Based on the subject's response, only 67 subjects (44.7%) subjects felt comfortable on'NIV' while majority of subjects i.e. 83 (55.3%) felt **discomfort** while on 'NIV'.

TABLE 4.7: Association between degree of 'NASI' andfactors related TO 'NIV' mode and setting

N = 150

SN	Particulars	Degree of NASI							
		D 1	D 2	D 3	Risk of 'NASI'	DF	Chi square value	P value	Significance
		f	f	f	f				
	Type ofmask								
	Face mask	0	1	0	39	6	27.86	<0.0001	S
	Nasal mask	6	5	1	20				
	Oronasalmask	23	20	15	20				
b)	**Duration of'NIV**								
1	Continuous	25	25	16	17	3	21.11	<0.0001	S
2	Intermittent	4	1	0	62				
c)	**'NIV' Mode**								
1	CPAP	20	16	10	48	3	0.6288	0.8898	NS
2	BIPAP	9	10	6	31				

NS: Non significance
DF: Degree of freedom
D: Degree of 'NASI'
S: Significance

Table 4.7 shows findings of the association between degrees of 'NASI' and factors related to 'NIV' mode and settings such as Type of mask, duration of 'NIV' and mode.The chi square test is used to find the association between degree of 'NASI' and factors. The calculated chi square value of the Type of mask is 27.86 whereas chi square criticalvalue of the same is 12.592. The calculated chi square value of Duration of 'NIV' is 21.11 while chi square critical value of the same is 7.815. thus, the calculated chi squarevalue of type of mask and duration of 'NIV' is greater than chi square critical value andP value of the same is <0.0001 which is less than 0.05 level of significance, **thereforenull hypothesis (H0) is rejected and alternative hypothesis (H1) is accepted for Type of mask and duration of 'NIV'.** But the calculated chi square value of 'NIV' mode is 0.6288 whereas the chi square critical value of the same is 7.815. thus, the calculated chi square value of 'NIV' modeis less than chi square critical value and P value of the same is 0.8898 which is greaterthan 0.05 level of significance, **therefore null hypothesis (H0) is accepted and alternative hypothesis (H1) is rejected for 'NIV' mode.**

"NON- INVASIVE VENTILATION CARE BUNDLE"

SN	CATEGORIES	NASI(NON INVASIVE VENTILATION SSOCIATED SKIN INJURY) PREVENTIVE CARE	REMARKS(BY STAFF NURSE ON SHIFT DUTY)
1	Pre application confirmation	Confirm the need of 'NIV' application.	Indication:
2.	'NIV' application counselling	Give health education on importance of 'NIV' (To maintain compliance to Non-invasive ventilation)	As per necessary topics from below Guideline.
3.	Pre application assessment	Assess the skin prior to NIV application.	Yes: No: Findings:
4.	Friction prevention	Apply facility approved cushioning to points of mask-skin contact.(Forehead, Nasal bridge, below nares, chin)	Type of Skin barrier: Site:
5.	Proper pressure & effective ventilation	Set non-invasive ventilator in right Mode and Setting.	Mode: Setting:
6.	Prevent shear, leakage & Discomfort	Follow proper mask or interface selection and fit techniques.	Type of mask:
7.	Timely Assessment	Skin assessment under and around interface device (Every 4 hourly)	Time of assessment:Findings:
8.	Skin hygiene	Moisture management practices	Mention selective practice:
9.	Skin Health	Remove mask when medically feasible, to maintain Nutrition &Fluid balance.	Type of Diet: Fluid Intake:
10.	Infection & DrynessPrevention	Oral hygiene & Eye care every four hourly.	Yes: No:

GUIDELINES FOR 'NIV' APPLICATION COUNSELLING

- ✓ Explain the disease condition and indication of using 'NIV'.
- ✓ Explain benefits of using 'NIV' as a curative measure.
- ✓ Introduce the patient slowly to the equipment and all its parts.
- ✓ Explain the working mechanism of non-invasive ventilator.
- ✓ Explain some minor symptoms that patient can feel during 'NIV' (nausea, headache, claustrophobia) which helps to gain patients confidence.
- ✓ Allow patient for opportunity to feel the operation of the machine through the mask on their hands or cheek before applying it over their nose or mouth which helps to maintain compliance to 'NIV'.
- ✓ Allow patient for opportunity to practice breathing with the ventilator, either by holding the mask in place or allowing them to hold it inplace.

V. Acknowledgment

With sincere gratitude, the investigator wishes to acknowledge all those who have put their efforts in the making of this study. It was the contribution of many people, which helped in the successful completion of the study. I owe my heartfelt gratitude to those patients. who have participated in this study and provide me all the information required for the completion of the project and without whom this project would have been incomplete.

REFERENCES

[1] Davies M, et al. British Thoracic Society Quality Standards for acute non-invasive ventilation in adults. BMJ Open Respiratory Research. 2018;5(1): e000283.
[2] Wang S, et al. Epidemiology of non-invasive mechanical ventilation in acute respiratory failure - a retrospective population-based study. BMC Emergency Medicine. 2013;13(1).
[3] García-Fernández F, et.al. Classification of dependence-related skin lesions: a new proposal. Journal of Wound Care. 2016;25(1):26-32.
[4] Carron M, et al. Complications of non-invasive ventilation techniques: a comprehensivequalitative review of randomized trials. British Journal of Anaesthesia. 2013;110(6):896-914.
[5] Zhan Q, et al. Early use of non-invasive positive pressure ventilation for acute lung injury. Critical Care Medicine. 2012;40(2):455-460.
[6] Black J, et.al. Medical device related pressure ulcers in hospitalized patients. International Wound Journal. 2010;7(5):358-365.
[7] Clinical Indications for Non-invasive Positive Pressure Ventilation in Chronic Respiratory Failure Due to Restrictive Lung Disease, COPD, and Nocturnal Hypoventilation-A Consensus Conference Report. Chest. 1999;116(2):521-534.
[8] Hess D. Non-invasive Ventilation for Acute Respiratory Failure. Respiratory Care. 2013;58(6):950-972.
[9] Thompson D. A critical review of the literature on pressure ulcer aetiology. Journal ofWound Care. 2005;14(2):87-90.