

# Prevalence of nasal septum injury in premature infants using nasal prongs

PREVALÊNCIA DE LESÃO DO SEPTO NASAL EM PREMATUROS NO USO DE PRONGAS NASAIS

PREVALENCIA DE LESIONES DE SEPTO NASAL EN EL USO DE CÁNULAS NASALES

Nayara Francisca Cabral de Sousa<sup>1</sup>, Suely de Fátima Santos Freire Bonfim<sup>2</sup>,  
Maria Gorete Lucena de Vasconcelos<sup>3</sup>, Joana Lidyanne de Oliveira Bezerra<sup>4</sup>,  
Daiana Vieira Câmara da Silva<sup>5</sup>, Luciana Pedrosa Leal<sup>6</sup>

## ABSTRACT

The aim of this study was to investigate the prevalence and factors associated with nasal septum injury in preterm infants in the use of noninvasive ventilation. A cross-sectional study with data collection between March and July 2012 and with search for records, interviews with mothers and nasal evaluation of 47 premature in the neonatal unit of a teaching hospital in Recife, Pernambuco, northeastern Brazil. A descriptive bivariate statistical analysis was performed through the chi-square test or Fisher exact test using the SPSS software. The prevalence of nasal lesions was 68.1%, associated with low birth weight and duration of treatment. The prevalence of nasal injury in this population is high and associated with low birth weight and length of stay in noninvasive ventilation. Due to these facts the necessity for preventive actions was noticed, such as continuous care in nursing, suitability of devices and permanent education in service.

## DESCRIPTORS

Infant, premature  
Nasal septum  
Wounds and injuries  
Neonatal nursing  
Nursing care

## RESUMO

O objetivo do estudo foi investigar a prevalência e os fatores associados à lesão do septo nasal em prematuros sob uso de ventilação não invasiva. Estudo transversal, cujos dados foram coletados entre março e julho de 2012 por meio de busca em prontuários, entrevistas às mães e avaliação nasal de 47 prematuros, na Unidade Neonatal de um Hospital Universitário da cidade do Recife, Pernambuco, região nordeste do Brasil. Realizou-se análise estatística descritiva e bivariada por meio do teste qui-quadrado ou Exato de Fisher, utilizando o *software* SPSS. A prevalência de lesão nasal foi de 68,1%, associada ao baixo peso ao nascer e à duração do tratamento. A prevalência de lesão nasal na população estudada é elevada e associa-se ao baixo peso ao nascer e ao tempo de permanência em ventilação não invasiva. Infere-se a necessidade de ações preventivas, como cuidados de Enfermagem contínuos, adequação dos dispositivos e educação permanente em serviço.

## DESCRITORES

Prematuro  
Septo nasal  
Ferimentos e lesões  
Enfermagem neonatal  
Cuidados de enfermagem

## RESUMEN

Investigar la prevalencia y factores asociados con la lesión del tabique nasal en bebés prematuros en uso de la ventilación no invasiva. Estudio de corte transversal, los datos se obtuvieron de los registros médicos, entrevistas con las madres y 47 de evaluación prematura de nasal entre marzo y julio de 2012, en la unidad neonatal de un hospital universitario de Recife, Pernambuco, Noreste de Brasil. El análisis se realizó mediante estadística descriptiva y bivariado mediante la prueba de chi-cuadrado o la prueba exacta de Fisher, utilizando el *software* SPSS. La prevalencia de lesiones nasales fue 68,1%, bajo peso al nacer y la duración del tratamiento se asoció con una lesión nasal. La prevalencia de lesión nasal en esta población es alta y se asocia con bajo peso al nacer y la duración de la estancia en la ventilación no invasiva. Esto infiere la necesidad de medidas preventivas, como la atención de enfermería, un ajuste continuo de los dispositivos de servicio y educación continua.

## DESCRIPTORES

Prematuro  
Tabique nasal  
Heridas y traumatismos  
Enfermería neonatal  
Atención de enfermería

<sup>1</sup>Nurse. Specialist in Child Health, Nurse Residency Program, Department of Nursing, Center for Health Sciences, Hospital das Clínicas, Universidade Federal de Pernambuco, Recife, PE, Brazil. [nayarafcsousa@gmail.com](mailto:nayarafcsousa@gmail.com) <sup>2</sup>MSc in Nursing. Nurse of the neonatal Unit, Hospital das Clínicas, Universidade Federal de Pernambuco, Recife, PE, Brazil. <sup>3</sup>Post-Doctorate in Nursing. Associate Professor, Department of Nursing, Center for Health Sciences, Universidade Federal de Pernambuco, Recife, PE, Brazil. <sup>4</sup>MSc in Nursing. Substitute Professor, Department of Nursing, Center for Health Sciences, Universidade Federal de Pernambuco, Recife, PE, Brazil. <sup>5</sup>Nurse. Graduate Department of Nursing, Center for Health Sciences, Universidade Federal de Pernambuco, Recife, PE, Brazil. <sup>6</sup>PhD in Nutrition. Adjunct Professor, Department of Nursing, Center for Health Sciences, Universidade Federal de Pernambuco, Recife, PE, Brazil.

## INTRODUCTION

Improvements in the quality of antenatal care, from care during labor until the delivery room and neonatal care have reflected in the survival of premature and very low birth weight babies in different regions and countries of the world<sup>(1)</sup>. At birth, neonates undergo physiological adaptations, especially those related to breathing and few minutes of severe oxygen deprivation can cause irreversible brain damage<sup>(2)</sup>. The preterm infants do not have adequate pulmonary function, which increases the chances of respiratory problems<sup>(3)</sup> requiring ventilatory assistance.

Among the techniques of administering oxygen to newborn preterm infants (PTI), the method of non-invasive ventilation (NIV) has been successfully used. This type of ventilatory support is an effective alternative to reduce the time of transition from mechanical ventilation to spontaneous breathing in the treatment of respiratory distress of premature babies<sup>(4)</sup>. Some devices are used for application of this system, such as face mask, nasal mask, tracheal tube, intubation, short single nasal prong, nasopharyngeal prong and short binasal prong, which is the most widely used in health services for its easy application in neonatal clientele, especially in Northeastern Brazil<sup>(4-6)</sup>.

However, its therapeutic use can lead to complications related to air leakage, favoring the reduction of supplied pressure, dryness of mucous membranes, difficult tolerance to devices, occurrence of barotrauma and abdominal distension<sup>(7-8)</sup>.

Despite technological advances being an important step in caring for PTI, adverse events still represent a very common reality in neonatal units. Nasal prongs are the most used devices for administration of NIV. Its use can lead to the development of columella and nasal septum injuries – the main damages of this type of equipment due to its positioning and location – which are increasingly present adverse events in neonatal units<sup>(4,9-12)</sup>.

A recent study showed that the lesion of the nasal septum was responsible for 6% of adverse events in a neonatal reference unit in Northeastern Brazil<sup>(13)</sup>. The literature suggests that the prevalence is increasing in spite of nursing care with the use of techniques to prevent these injuries. Thus the best form of prevention is the continuous monitoring<sup>(9,14-15)</sup>.

Based on the risks associated with the use of prongs for application of NIV, the present study aimed to investigate the prevalence and factors associated with nasal septum injury in preterm infants in the use of non-invasive ventilation in a teaching hospital in Recife-PE.

## METHOD

Cross-sectional study in the Neonatal Intensive Care Unit of the Hospital das Clínicas, linked to the Universidade Federal de Pernambuco, in the city of Recife, Northeast of Brazil.

The study population consisted of preterm infants undergoing non-invasive ventilation born in the aforementioned hospital in the period between March and July 2012. The sample was a convenience sample and comprised 47 premature in use of NIV.

It were excluded from the study the preterm infants with deformities or nasal lesions identified on physical examination at admission, shock, coagulation disorders, children of mothers with hearing or cognitive impairments that prevented the application of the technique of interview, those whose mothers had died in childbirth or post-delivery, and also those whose identity and socio-economic data were not available in the respective medical records.

Data were collected in two stages. The first was an interview with the preterm infants' mothers to obtain socioeconomic data which was not available in the admission form neither in the medical records of these patients. The second stage corresponded to the evaluation of the nasal area of the neonate at the time of hospital discharge to identify the presence and stage of nasal injury.

The variables of the instrument for data collection related to preterm infants were sex, gestational age (weeks), birth weight (grams) and Apgar scores at one and five minutes of life. Maternal variables included age, type of delivery and number of live births (parity). Socioeconomic variables were: marital status, education, occupation, income and housing. Regarding therapy, it were investigated the indications for the use of NIV and the stage of the lesion (I – hyperemia; II – disruption of skin integrity and the onset of bleeding and ulcerated lesion; III - lesion in the subcutaneous tissue without involvement of tendons and muscles)<sup>(16)</sup>.

To assess the socioeconomic conditions, it were used as parameters the data on education and labor and social indicators provided by the IBGE – *Instituto Brasileiro de Geografia e Estatística* (Brazilian Institute of Geography and Statistics). Income was divided into less, equal or greater than half the Brazilian minimum wage; housing was ranked as owned, rented or given; and education in illiterate, primary, secondary and tertiary<sup>(17)</sup>.

To assess the gestational age (GA), the classification of the World Health Organization (WHO)<sup>(18)</sup> was used. It

**Nasal prongs are the most used devices for administration of NIV. Its use can lead to the development of columella and nasal septum injuries – the main damages of this type of equipment due to its positioning and location – which are increasingly present adverse events in neonatal units.**

considers as extremely premature the babies with GA less than 28 weeks, as very premature the ones with GA between 28 and 32.6 weeks and as borderline preterm the babies with GA between 32 and 36.6 weeks. The number of prenatal visits was ranked as lower than six and greater than or equal to six, according to the recommended by the Ministry of Health of Brazil (MS).<sup>(19)</sup> Birth weight was classified as extremely low birth weight (<1,000g), very low birth weight (<1,500g) and low birth weight (<2,500g)<sup>(20)</sup>.

Software SPSS 18.0 was used for data tabulation and analysis. The Kolmogorov-Sminorv test was used to examine the normality of continuous variables, and to describe them the median, mean and standard deviation were used. Absolute and relative frequencies were calculated for categorical variables. The chi-square test was used to assess the association between sex, gestational age, birth weight and length of stay in the NIV and the presence of nasal injury. The Fisher exact test was used when the expected values were less than five.

The study complied with the guidelines for research with human beings Resolution No. 466/2012 of the National Health Council. The project was approved by the Ethics in Research Committee of the Center for Health Sciences of the UFPE, under protocol No. 540/11. The term of informed consent (IC) was signed by the mothers participating in the study.

## RESULTS

With respect to maternal data, 78.7% of mothers were aged older than or equal to 20 years and 70.0% had a stable relationship while 27.9% were married. A total of 38.3% worked outside the home and 21.3% of these were domestic jobs. With regard to family income 51.1% of mothers received more than half the Brazilian minimum wage and 23.4% had no source of income. In relation to housing 57.3% lived in their property and 34% in rented properties and 53.2% of households had sanitation. Regarding education, 42.6% had studied up to 9<sup>th</sup> grade, 16.0% had attended or were attending college and 2.1% of the sample was illiterate. In respect to the number of prenatal visits, 68.1% of these mothers held more than six visits.

The distribution of preterm infants by sex was similar. In relation to gestational age, the majority were borderline premature (61.3%) with a mean gestational age of 31.4 weeks (SD=8.5). It was found that 89.4% had low birth weight (Table 1) and the median Apgar score was 7 at the first minute of life of preterm infants and 9 at five minutes.

The majority (68.1%) of the sample had lesion of nasal septum (95% CI: 52.7 to 80.5) with stage II (50.0% - 95% CI: 32.2 to 67.8) as the most frequent (Table 2).

**Table 1** – Sex, gestational age and birth weight of preterm infants in the use of NIV – Recife, PE, 2012.

Variables	N	%
<b>Sex</b>		
Male	23	48.9
Female	24	51.1
<b>Gestational age (weeks)*</b>		
<28 weeks	9	20.5
28 to 31,6 weeks	8	18.2
32 to 36,6	27	61.3
<b>Birth weight (grams)</b>		
<1.000	9	19.0
1.001 to 1.500	15	32.0
1.501 to 2.500	18	38.4
>2500	5	10.6

\* Three cases ignored

**Table 2** – Presence and degree of nasal injury in preterm infants in the use of NIV – Recife, PE, 2012.

Variables	N	%
<b>Lesion</b>		
Absent	15	31.9
Present	32	68.1
<b>Degree of injury</b>		
I	14	43.7
II	16	50.0
III	2	6.3

With regard to the length of stay in use of the method, 42.5% of the population remained over 72 hours under non-invasive ventilation. The most frequent indication for NIV was prematurity (91.5%) followed by respiratory distress syndrome, present in 70.2% of the sample.

**Table 3** – Length of time and indication of the use of NIV in preterm infants – Recife, PE, 2012.

Variables	N	%
<b>Length of stay in use of the method (hours)</b>		
24	17	36.2
48	10	21.3
72 or longer	20	42.5
<b>Indication</b>		
Respiratory distress syndrome	33	70.2
Very low birth weight newborn	2	4.3
Preterm newborn	43	91.5
Respiratory distress	26	55.3
Transient tachypnea of the newborn	12	25.5

Regarding the assessment of injury to the nasal septum by sex and gestational age, there was no statistically significant difference. Birth weight and length of stay in the NIV showed a statistically significant difference in the occurrence of nasal injury. A higher prevalence of injury was observed in children of very low birth weight that remained between 25 and 48 hours in treatment (Table 4).

**Table 4** – Evaluation of nasal septum injury by sex, gestational age, birth weight, length of stay in the method and indication in preterm infants – Recife, PE, 2012.

Variables	Presence of injury				Statistical test
	Present		Absent		
	N	%	N	%	
<b>Sex</b>					
Female	16	66.7	8	33.3	$\chi^2=0.045$ p=0.83
Male	16	69.6	7	30.4	
<b>Gestational age (weeks)</b>					
< 28	7	77.8	2	22.2	*p=1
28 to 31,6	6	75.0	2	25.0	
32 to 36,6	19	70.3	8	29.7	
<b>Peso ao nascer (gramas)</b>					
< 1.000 g	5	55.5	4	44.5	*p=0.04
1.001 to 1.500 g	14	93.3	1	6.7	
1.501 to 2.500g	11	61.1	7	38.9	
Birth weight (grams)	2	40.0	3	60.0	
<b>Tempo de permanência (horas)</b>					
24	7	41.2	10	58.8	*p=0.01
25 to 48	9	90.0	1	10.0	
72 or mais	16	80.0	4	20.0	

\*Fisher exact test

## DISCUSSION

Birth weight and length of stay in the NIV show statistical association with the presence of nasal septum injury. Such prevalence may be related to vulnerability in appearance of lesions in neonates of low birth weight and that remain longer under NIV<sup>(9,15,21-22)</sup>. The prevalence of lesions was 68.1% which is close to the national data found in the last decade, ranging from 85 to 100%<sup>(4,9)</sup>. International studies show incidences from 13 to 42.5%<sup>(10, 21, 23)</sup>.

It is noteworthy that the device used for administration of NIV in this study was the short binasal prong. This device can lead to the early onset of nasal trauma<sup>(22)</sup> – when comparing it to other types (nasal mask) – although it is still considered the best one for application of NIV<sup>(4,24)</sup>.

Regarding the severity of injuries, there was a higher prevalence of stages I and II. Equivalent results were identified in a comparative study between two nasal devices, in

which 58.8% of the population used the prong and 50% of those who used mask showed lesions on stage II<sup>(9,22)</sup>.

Nursing care such as daily inspection of the nasal columella, suction probes with small caliber (No. 4), use of nasal protection (hydrocolloid), comfort massages and continuous monitoring minimize the emergence and aggravation of injuries<sup>(12,14-15)</sup>.

The immaturity of the gastrointestinal system of preterm infants with low birth weight affects the rates of infant mortality<sup>(25)</sup>. In this sample, the low birth weight appeared as an associated factor for the development of nasal lesions, which can be justified by the increased predisposition of neonates to skin lesions due to greater cutaneous fragility and immaturity<sup>(26)</sup>. Research has shown that most of nasal trauma occurs during the first days in the method, while its frequency and severity are inversely proportional to gestational age and birth weight<sup>(9,21-22)</sup>. In this study, no association was found between GA and the appearance of lesions in preterm infants receiving nasal septum NIV. Such association is directly related to the appearance of skin lesions due to the immaturity of the tissues<sup>(10,27-30)</sup>.

In relation to the time spent in therapy, it was identified that the preterm infants who used nasal prongs for longer were more likely to nasal injury, showing statistically significant association. In studies with a similar population, neonates showed nasal lesions with 48 hours of using the method<sup>(9,22)</sup>.

In the nursing care to neonates undergoing NIV with the use of nasal prongs it is necessary to direct greater attention to the very low birth weight preterm infants that remain for more than 72 hours in the NIV because of their greater susceptibility to the appearance of lesions<sup>(12,14-15)</sup>. Scientific evidence indicates the need for continuous monitoring of the neonate and staff training in health related to the use of the method, as well as the suitability of the devices used in therapy<sup>(14-15)</sup>.

## CONCLUSION

Birth weight and length of use of NIV with short binasal prongs were directly associated with the appearance of nasal septum injury. The variables GA and sex showed no relationship with the onset of lesions although being mentioned in the literature.

The results of this study reinforce the fact that nursing care is one of the pillars of prevention of nasal lesions in preterm infants in the NIV who use nasal prongs. The care in handling, maintenance and sitting of equipment that make up the circuit should be prioritized. Studies aimed at evaluating such care must be carried out with the objective of minimizing the risks of inappropriate use of NIV. Longitudinal studies should be developed with representative samples to assess the relation of cause and effect taking into account the exposure time of preterm infants to NIV.

## REFERENCES

1. Costa R, Padilha MI, Monticelli M. Production of knowledge about the care given to newborns in neonatal IC: contribution of Brazilian nursing. *Rev Esc Enferm USP* [Internet]. 2010 [cited 2013 Mar 19];44(1):199-204. Available from: [http://www.scielo.br/pdf/reeusp/v44n1/en\\_a28v44n1.pdf](http://www.scielo.br/pdf/reeusp/v44n1/en_a28v44n1.pdf)
2. Barbosa AL, Chaves EMC, Campos ACS. Caracterização dos recém-nascidos em ventilação mecânica em uma unidade neonatal. *Rev RENE*. 2007;8(2):35-40.
3. Tamez RN, Silva MJP. Enfermagem na UTI Neonatal: assistência ao recém-nascido de alto risco. Rio de Janeiro: Guanabara Koogan; 2010. Distúrbios respiratórios; p. 101-31.
4. Medeiros SK, Carvalho WB, Soriano CF. Practices of use of nasal intermittent positive pressure ventilation (NIPPV) in neonatology in northeastern Brazil. *J Pediatr*. 2012;88(1):48-53.
5. De Paoli AG, Davis PG, Faber B, Morley CJ. Devices and pressure for administration of nasal continuous positive airway pressure (NCPAP) in preterm neonates. *Cochrane Database Syst Rev*. 2008;(1):CD002977.
6. Sola A. Cuidados neonatais: descobrindo a vida de um recém-nascido enfermo. Buenos Ayres: Ediciones Médicas; 2012.
7. Walsh M, Engle W, Lupton A, Kazzi SNJ, Buchter S, Rasmussen M, et al. Oxygen delivery through nasal cannulae to preterm infants: can practice be improved? *Pediatrics*. 2005;116(4):857-61.
8. Figueruelo AG, Villaescusa JU, Pietro MB, García ML, Bartolomé SM, Cid JLH. Utilización de cânulas nasales de alto flujo para la ventilación no invasiva em niños. *An Pediatr (Barc)*. 2011;75(3):182-87.
9. Nascimento RN, Ferreira ALC, Coutinho ACFP, Veríssimo RCSS. The frequency of nasal injury in newborns due to the use of continuous positive airway pressure with prongs. *Rev Lat Am Enferm*. 2009;17(4):489-94.
10. O'Brien K, Campbell C, Brown L, Wenger L, Shah V. Infant flow biphasic nasal continuous positive airway pressure (BP-NCPAP) vs infant flow NCPAP for the facilitation of extubation in infants'  $\leq$  1250 grams: a randomized controlled trial [images]. *BMC Pediatr*. 2012;12:43.
11. Chan KM, Chan HB. The use of bubble CPAP in premature infants: local experience. *J. Paediatr*. 2007;12(2):86-92.
12. McCoskey L. Nursing guidelines for prevention of nasal breakdown in neonates receiving nasal CPAP. *Adv Neonatal Care*. 2008;8(2):116-24.
13. Ventura CMU, Menezes JA, Alves JGB. Eventos adversos em uma unidade de terapia intensiva neonatal no Brasil. *Rev Bras Enferm*. 2012;65(1):49-55.
14. Antunes JCP, Nascimento MAL, Gomes AVO, Araujo MC, Christoffel MM. Tecnología secundaria el tratamiento del recién nacido prematuro (cuidados de enfermería en el uso del CPAP NASAL. *Enferm Global*. 2010;(20):1-11.
15. Squires AJ, Hyndman M. Prevention of nasal injuries secondary to NCPAP application in the ELBW infant. *Neonatal Netw*. 2009;28(1):13-27.
16. European Pressure Ulcer Advisory Panel; National Pressure Ulcer Advisory Panel. Prevention and treatment of pressure ulcers: quick reference guide [Internet]. Washington; 2009 [cited 2013 Mar 19]. Available from: [http://www.npuap.org/wp-content/uploads/2012/02/Final\\_Quick\\_Prevention\\_for\\_web\\_2010.pdf](http://www.npuap.org/wp-content/uploads/2012/02/Final_Quick_Prevention_for_web_2010.pdf)
17. Instituto Brasileiro de Geografia e Estatística (IBGE). Indicadores Sociais Municipais: uma análise dos resultados do universo do Censo Demográfico 2010. Rio de Janeiro; 2011.
18. World Health Organization. Born too soon: the global action report on preterm birth. Geneva: WHO; 2012.
19. Brasil. Ministério da Saúde; Secretaria de Atenção à Saúde. Atenção ao pré-natal de baixo risco. Brasília; 2012. (Cadernos de Atenção Básica, 32).
20. Brasil. Ministério da Saúde. DATASUS. Informações de Saúde [Internet]. Brasília; 2012 [citado 2012 nov. 28]. Disponível em: <http://www.datasus.gov.br>
21. Fischer C, Bertelle V, Holfeld J, Forcada-Guex M, Stadelmann-Diaw C, Tolsa JF. Nasal trauma due to continuous positive airway pressure in neonates. *Arch Dis Child Fetal Neonatal*. 2010;95(6):F447-51.
22. Yong SC, Chen SJ, Boo NY. Incidence of nasal trauma association with nasal prong versus nasal mask during continuous positive airway pressure treatment in very low birthweight infants: a randomized control study. *Arch Dis Child Fetal Neonatal*. 2005;90 (6):F480-3.
23. Robertson NJ, McCarthy LS, Hamilton PA, Moss AL. Nasal deformities resulting from flow driver continuous positive airway pressure. *Arch Dis Child Fetal Neonatal Ed*. 1996;75(3):209-88.
24. Sweet DG, Carnielli V, Greisen G, Hallman M, Ozek E, Plavka R, et al. European Consensus Guidelines on the management of neonatal respiratory distress syndrome in preterm infants – 2010 update. *Neonatology*. 2010;97(4):402-17.

25. Brasil. Ministério da Saúde; Secretaria de Atenção à Saúde. Atenção humanizada ao recém-nascido de baixo peso: Método Canguru. 2ª ed. Brasília; 2011.
26. Martins CP, Tapiá CEV. A pele do recém-nascido prematuro sob avaliação do enfermeiro: cuidado norteando a manutenção da integridade cutânea. *Rev Bras Enferm.* 2009;62(5): 778-83.
27. Saianda A, Fernandes RM, Saldanha J. Uso do método INSURE versus CPAP nasal isolado em recém-nascidos de muito baixo peso com 30 ou menos semanas de gestação. *Rev Port Pneum.* 2010;16(5):779-95.
28. Rastolgi S, Rajasekhar H, Gupta A, Bhutada A, Rastogi D, Wung JT. Factors affecting the weaning from nasal CPAP in preterm neonates [images]. *Int J Pediatr.* 2012;416073.
29. Carneiro JA, Vieira MM, Reis TC, Caldeira AP. Fatores de risco para a mortalidade de recém-nascido de muito baixo peso em Unidade de Terapia Intensiva Neonatal. *Rev Paul Pediatr.* 2012;30(3):369-76.
30. Fontanele FC, Cardoso MVLML. Lesões de pele em recém-nascidos prematuros internados numa unidade de terapia intensiva neonatal. *Rev RENE.* 2005;6(2):88-95.