Al-Kindy College Medical Journal (KCMJ)

Research Article

Effect of Protective Nasal Dressing on the Incidence and Severity of Nasal Injury in Preterm Infants Receiving Continuous Positive Airway Pressure: A Randomized Controlled Trial

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Article history:
Received 6 April 2026
Accepted 27 June 2026
Available online 1 August 2026

DOI: 10.47723/sp7x9h49

Keywords: nasal injuries; hydrocolloid dressing; continuous positive airway pressure; preterm infant; neonatal intensive care unit

ABSTRACT

Background: Continuous positive airway pressure-associated nasal injury persists as one of the most prevalent complications observed among preterm infants receiving non-invasive respiratory support in neonatal intensive care units. This study aims to evaluate the effect of the hydrocolloid protective nasal dressing on nasal injury for premature infants undergoing continuous positive airway pressure.

Subjects and Methods: A randomized controlled trial was conducted during three months, from 14 February to 16 May 2026, in the neonatal intensive care units of two teaching hospitals affiliated with the Maysan Health Department in Iraq. 80 preterm infants with gestational ages between 26 and 36 weeks who required at a minimum 72 hours of CPAP intervention were consecutively recruited and randomly allocated into intervention and control groups. Infants in the intervention group received a hydrocolloid protective nasal dressing along with routine care, whereas the control group received routine care only. Nasal injury was assessed using the nasal injury assessment score chart over a 72-hour follow-up period.

Results: Infants receiving hydrocolloid protective dressing showed a significantly reduced incidence and severity of nasal injury related to CPAP at 32.5% compared with 100% in the control group. The intervention also delayed the onset and progression of tissue injury, while maintaining skin integrity throughout the intervention period. No cases of CPAP failure requiring airway intubation were observed in each group.

Conclusions: The nasal protective dressing evaluated in this study is a safe and effective intervention for reducing the incidence of nasal injuries among preterm infants receiving continuous positive airway pressure.

Introduction

Premature infants are particularly susceptible to a wide range of complications attributed to the immaturity of their organs and body systems. Among these complications, respiratory distress syndrome (RDS) remains one of the leading causes of neonatal morbidity, mortality, and admission to neonatal intensive care units (NICUs) 1. The structural and functional immaturity of the respiratory system in preterm infants contributes substantially to impaired gas exchange and respiratory instability, necessitating specialized respiratory support during the early neonatal period [2].

Mechanical ventilation (MV) remains an essential component of respiratory support for infants with RDS; its application is

accompanied by a range of potential complications that can contribute to increased morbidity and prolonged hospitalization [3]. However, increasing recognition of ventilation-induced lung injury and bronchopulmonary dysplasia has led to a growing preference for non-invasive respiratory support modalities [4,5]. Nasal continuous positive airway pressure (N-CPAP) is currently considered the standard first-line respiratory support strategy for many preterm infants with RDS [6]. Maintaining continuous positive airway pressure (CPAP) helps prevent lung collapse, increases alveolar surface area, enhances ventilation-perfusion matching, improves oxygenation, and maintains upper airway clearness [7]. Despite its well-established clinical benefits, prolonged use of CPAP interfaces may result in serious complications such as pressure ulcers, particularly nasal injuries, which could be a critical health problem [8-10].

Nasal injury is defined as damage to the skin or underlying tissues resulting from sustained pressure or friction [11]. CPAP-related nasal injury is recognized as one of the most common complications among preterm infants receiving non-invasive respiratory support in NICUs. The pathophysiology of CPAP-related nasal injury is primarily associated with continuous localized pressure, frictional forces, moisture accumulation, repetitive movement of the nasal interface, and prolonged skin-device contact. Due to the immaturity and fragility of the skin in preterm infants, even minimal mechanical pressure may rapidly progress damage and ulceration of the tissue [12]. The clinical signs of CPAP-associated nasal injury vary from minor erythema and skin blanching to deep ulceration and in severe cases tissue necrosis. Such injuries may result in long-term adverse events, including nasal deformities, scarring, discharge, bleeding, feeding difficulties, significant infant discomfort, and pain [13]. Epidemiological evidence indicates that international complications of CPAP-associated nasal injury in preterm infants remain the most common problem, with incidence rates up to 90% depending on the infant characteristics, respiratory interfaces preventive care protocols, and assessment tool utilized to define tissue damage. Similar issues have been reported in Iraqi NICUs [14-16]. This high incidence reflects a substantial clinical burden that directly impacts patient protection, comfort, and adherence to respiratory support. Importantly, nasal injury is not merely a minor adverse effect but a major complication that can interrupt respiratory support, compromise clinical stability, and increase healthcare costs due to the need for additional interventions such as surgical management [17,18].

Hydrocolloid protective dressings have emerged as a promising preventive intervention for reducing device-related pressure injuries in vulnerable neonatal populations. Hydrocolloid protective dressings have become an increasingly recognized preventive strategy in neonatal intensive care units worldwide for reducing device-related nasal injury associated with non-invasive respiratory support. Their use in neonatal practice was first described in the early 2010s, when clinical studies began evaluating their role in protecting the fragile nasal tissues of preterm infants receiving N-CPAP. Since then, evidence from studies conducted in several countries, including Turkey, China, Lebanon, Iran, Brazil, and Canada, has consistently demonstrated that hydrocolloid dressings reduce both the incidence and severity of CPAP-related nasal injury while preserving nasal tissue integrity. The protective effect of these dressings is attributed to their capacity to redistribute localized pressure, minimize friction and shear forces, and maintain a favorable microenvironment that supports skin integrity [18-20]. Although previous studies have reported beneficial effects of hydrocolloid dressings in preventing CPAP-related nasal injury [20,21], prophylactic nasal dressings and regular interface inspection are recommended to prevent nasal injury and provide more effective respiratory support for preterm infants in Iraq [14].

Consequently, evidence from randomized controlled trials and standardized guidelines regarding the routine use of protective nasal dressings in Iraqi neonatal intensive care units remains scarce, and no Iraqi randomized controlled trial has previously evaluated their effectiveness in preventing CPAP-related nasal injury. Therefore, this randomized controlled trial aimed to determine the effect of hydrocolloid protective nasal dressing on the incidence and severity of nasal injury among preterm infants receiving continuous positive airway pressure.

Subjects and Methods

A randomized controlled trial was conducted over 3 months between 14 February 2026 and 16 May 2026 in the NICUs at Maysan Teaching Hospital for Child and Labor and Al-Hakeem Teaching Hospital in Maysan, Iraq. Stating that the guidelines for admission are the same in the two hospitals. Eligible participants were preterm infants with gestational ages ranging from 26 to 36 completed weeks who required at least 72 hours of CPAP therapy. Exclusion criteria included full-term infants (gestational age ≥37 weeks), congenital craniofacial malformations affecting the nasal structure (including cleft lip, cleft palate, and nasal hypoplasia), pre-existing nasal injury before CPAP initiation, parental refusal to provide informed consent, and infants who died before completion of outcome assessment.

The required sample size was calculated using G*Power software (Version 3.1.9.4). Sample size estimation was based on a two-group comparison with a significance level (α) of 0.05, statistical power (1−β) of 80%, and an anticipated medium effect size (f = 0.30). The minimum sample size was calculated as 64 participants (32 infants for each group). To address possible participants' loss and improve statistical power, the sample size was increased to 80 infants (40 infants for each study group).

Eligible infants were recruited using a consecutive sampling method by the researcher, ensuring that all infants admitted to the ward who met the inclusion criteria were eligible to participate. After enrollment, infants were randomly assigned to either the intervention or control group using a simple randomization procedure, depending on color-coded cards prepared before participant recruitment. An equal number of cards were placed in sealed opaque envelopes and drawn sequentially after participant enrollment to ensure randomization and minimize bias. Preterm infants with red cards were assigned to the control group, while those with yellow cards were assigned to the intervention group. The randomization process was performed by an independent person who was not involved in patient enrollment, intervention application, outcome measurement, or statistical analysis. The CONSORT flowchart illustrating participant recruitment, group allocation, follow-up, and data analysis is presented in Figure 1.

This study was conducted as an open-label (unblinded) study because pediatric caregivers were aware of the intervention (Protective Dressing) being applied. However, to minimize performance and observation bias, all infants in both groups received standardized NICU care according to the same unit protocols, except for the application of the protective dressing. Nurses were instructed to follow the same respiratory care procedures for both groups throughout the study period. In addition, nasal injury assessments were conducted using predefined criteria and a structured assessment tool to improve consistency and reduce subjective interpretation during outcome evaluation.

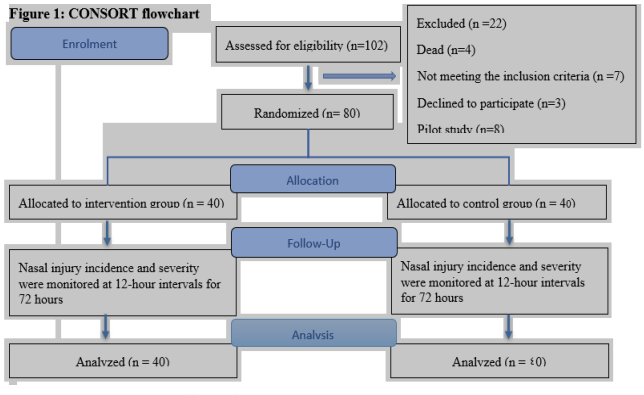


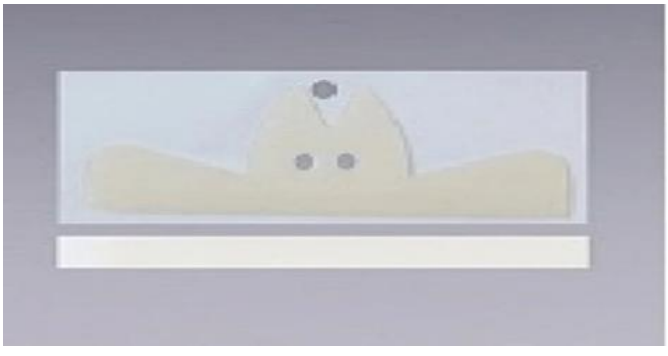
Figure 1: CONSORT flowchart

Data were collected using a structured tool consisting of two sections. The first section included demographic and clinical characteristics of enrolled infants. The second section included the nasal injury assessment score chart (NIASC), which was used to evaluate the incidence and severity of nasal injury associated with CPAP therapy.

The NIASC assesses six areas separately: nasal shape, nasal bridge, nasal tip, nasal septum, nostrils, and upper lip. Each area is assigned a specific score depending on observable clinical manifestations of skin injury. Total scores are calculated by summing all sub-scores and are subsequently categorized as follows: no injury (score = 0), mild injury (scores 1-4), moderate injury (scores 5-6), and severe injury (scores ≥7). According to the assessment tool, early skin changes such as mild erythema and blanching were classified as nasal injury.

All enrolled infants were managed according to the standard neonatal RDS protocol adopted in the participating NICUs. Initial respiratory support was provided using N-CPAP. Infants who met the unit criteria for surfactant therapy received exogenous surfactant administration according to the treating neonatologist's clinical judgment and established neonatal care guidelines before or during CPAP support as indicated. Following stabilization, infants continued to receive N-CPAP therapy and were monitored according to standard NICU protocols.

Infants assigned to the intervention group received hydrocolloid protective nasal dressing in addition to routine NICU care. The hydrocolloid nasal dressing used in this study was obtained from a reputable, acceptable-grade brand and was evidenced to be used as a safe tool. All dressings were obtained from the same manufacturer and were compatible with the CPAP interfaces used in the participating units. The dressing was anatomically designed to protect the nasal bridge, nasal septum, outer nostril margins, and upper lip. Dressing size was selected depending on the weight and nasal anatomy of the infant according to the manufacturer's instructions. Three dressing sizes were available (700-1250 g, 1250-2000 g, and >2000 g). Before application of the protective nasal dressing, the nasal region was cleansed and dried carefully using distilled water and cotton to promote adequate dressing adherence. The hydrocolloid was then applied immediately before CPAP therapy was initiated by the researcher. Once the dressing was placed, nasal prongs of the CPAP were inserted and adjusted by trained NICU nurses according to NICU protocols (Figure 2).



A

B

Figure 2: A. Hydrocolloid Nasal Dressing B. Dressing on Preterm Infant

The infant allocated to the control group received routine NICU care. Routine care consisted of gentle massage of the nasal septum and nostrils using 5% sodium chloride ointment before application of CPAP therapy according to standard unit practices. No protective hydrocolloid dressing was applied in this group. The researcher monitored both groups and assessed nasal incidence and injury severity using the nasal injury assessment score chart every 12 hours for 72 hours following CPAP therapy. The primary outcome of the study was the incidence of CPAP-associated nasal injury. Secondary outcomes included injury severity, time to first injury occurrence, time to peak injury severity, and CPAP failure. which was evaluated based on oxygen saturation, skin color, and signs of respiratory distress.

The researcher explained the objectives and the research process to the infant's parents and obtained written consent for participation. The

Committee of Scientific Research Ethics at the University of Baghdad / College of Nursing confirmed this interventional study. As an integral part of the initial RCT, we obtained approval for the trial registration from the Chinese Registry of Clinical Trials (ChiCTR) on 13th February 2026. The clinical trial registration number is ChiCTR2600118941.

Data were analyzed using IBM SPSS Statistics Version 26. Descriptive statistics were used to summarize demographic and clinical characteristics. Categorical variables were analyzed using Pearson's Chi-square test or Fisher's Exact Test when appropriate. Continuous and ordinal variables were analyzed using the Mann–Whitney U test due to non-normal score distributions. Statistical significance was established at $P < 0.05$.

Table 1: Demographic and Clinical Characteristics of the Study and Control Groups (N=80)

Characteristics		Study Group (n=40)	Control Group (n=40)	Test Value	df	P-value
Categorical Variables		n (%)	n (%)			
Sex	Male	25 (62.5)	25 (62.5)	χ^2 =0.000	1	1.000
	Female	15 (37.5)	15 (37.5)			
Gestational Age	26 - 29 Weeks	13 (32.5)	16 (40.0)	χ^2 =0.49	2	0.780
	30 - 33 Weeks	12 (30.0)	11 (27.5)			
	34 - 36 Weeks	15 (37.5)	13 (32.5)			
Birth Weight	< 1000 g	3 (7.5)	3 (7.5)	χ^2 =0.79	4	0.940
	1000 - 1500 g	11 (27.5)	14 (35.0)			
	1501 - 2000 g	11 (27.5)	11 (27.5)			
	2001 - 2500 g	12 (30.0)	9 (22.5)			
	> 2500 g	3 (7.5)	3 (7.5)			
Cannula Size	Small	20 (50.0)	18 (45.0)	χ^2 =0.20	1	0.654
	Medium	20 (50.0)	22 (55.0)			

n: Frequency; %: Percentage; SD: Standard Deviation; $\chi 2$: Chi-square test; df: degrees of freedom. Fisher's Exact Test confirmed no significance for all variables due to some low expected counts. * Significant at $P < 0.05$.

Table 1. Demographic analysis demonstrated that 62.5% of the study and control groups were male. Regarding gestational age, the distribution differs between the two groups; the highest percentage for the study group was in the (34-36 weeks) category at 37.5%, while the highest percentage for the control group was in the (26-29 weeks) category at 40.0%. Regarding birth weight, the difference in the distribution between the two groups was that the highest percentage for the study group was in the 2001 - 2500 g category at 30.0%, while the highest percentage for the control group was in the 1000 - 1500 g category at 35.0%

As demonstrated in Table 1, there were no statistically significant differences between the study and control groups regarding demographic characteristics ($P > 0.05$). This indicates that both groups were homogeneous and comparable at the baseline before the intervention.

Table 2. Details of the outcomes regarding nasal injury and CPAP safety. The results demonstrate a highly significant difference in the incidence of nasal injury between the groups ($\chi 2= 40.75$, $P < 0.001$). While 100% of infants in the control group sustained nasal injuries, only 32.5% of the study group were affected, with 67.5% remaining injury-free. Regarding severity, the intervention indicates highly effective ($\chi 2= 80.00$, $P < 0.001$). The majority of injuries were Severe (75%) or Moderate (25%) in the control group. In contrast, the study group experienced zero moderate or severe injuries; all recorded injuries were Mild (32.5%). The timing of injury also differed significantly ($\chi 2 = 80.00$, $P < .001$). Injuries in the control group appeared very early, with 100% of cases, the signs were appeared within the first 36 hours (35% at 12 h, 25% at 24 h, 40% at 36 h). Conversely, injuries in the study group were significantly delayed, appearing only at 60 hours (15%) or 72 hours (17.5%). Finally, regarding safety, there was no CPAP failure in both groups. All 80 infants (100%) in both groups completed the CPAP therapy without requiring intubation.

Table 3 demonstrates the progression of nasal injury scores over the 72-hour observation period. At baseline (pre-procedure), both groups scored identical mean scores of 0.00, indicating no nasal injuries prior to the application of N-CPAP therapy. However, statistically significant differences were observed between the study

and control groups at all subsequent assessment intervals as measured by the Mann-Whitney U test ($P < 0.001$). Infants in the control group exhibited a gradual deterioration in nasal skin integrity, with mean injury scores increasing from 0.70 ± 1.04 at 12 hours to 9.20 ± 2.40 at 72 hours. In contrast, infants in the study group showed no significant nasal injuries during the first 48 hours of assessment, maintaining a mean score of 0.00 throughout this period. Only minor injury scores were recorded in subsequent later assessments, reaching 0.25 ± 0.67 at 60 hours and 0.63 ± 1.03 at 72 hours

Table 2: Comparison of Primary and Secondary Clinical Outcomes Between the Intervention and Control Groups (N=80)

Characteristics		Study Group (n=40)	Control Group (n=40)	Test Value	df	P-value
Nasal Injury Outcomes		n (%)	n (%)			
Incidence of Nasal Injury	No Injury	27 (67.5)	0 (0.0)	χ^2= 40.75	1	<0.001*
	Yes (Any Injury)	13 (32.5)	40 (100.0)			
Final Severity of Injury	No Injury (Score 0)	27 (67.5)	0 (0.0)	χ^2= 80.00	3	<0.001*
	Mild (Score 1-4)	13 (32.5)	0 (0.0)			
	Moderate (Score 5-6)	0 (0.0)	10 (25.0)			
	Severe (Score ≥7)	0 (0.0)	30 (75.0)			
Time of First Injury	No Injury	27 (67.5)	0 (0.0)	χ^2= 80.00	5	<0.001*
	At 12 hours	0 (0.0)	14 (35.0)			
	At 24 hours	0 (0.0)	10 (25.0)			
	At 36 hours	0 (0.0)	16 (40.0)			
	At 60 hours	6 (15.0)	0 (0.0)			
	At 72 hours	7 (17.5)	0 (0.0)			
Time of Peak Injury	No Injury	27 (67.5)	0 (0.0)	χ^2 =43.01	2	<0.001*
	At 60 hours	2 (5.0)	1 (2.5)			
	At 72 hours	11 (27.5)	39 (97.5)			
CPAP Safety Outcome		n (%)	n (%)			
CPAP Failure	Success (No Failure)	40 (100)	40 (100)	NA[a]	-	-
	Failure (Intubated)	0 (0.0)	0 (0.0)			

χ2: Pearson Chi-square test; df: degrees of freedom. * Significant at $P < 0.05$. Fisher's Exact Test confirmed significance for all variables due to some low expected counts. a No statistics computed potentially related to CPAP Failure is a constant (0% in both groups).

Table 3: Comparison of Nasal Injury Scores Between Groups at Different Time Intervals (N=80)

Time Intervals	Study Group (n=40)	Control Group (n=40)	Mann–Whitney U	Z	P-value
Nasal Injury Score	Mean ± SD	Mean ± SD			
Pre-Procedure	0.00 ± 0.00	0.00 ± 0.00	NA[a]	-	-
1st Day: 12 Hours	0.00 ± 0.00	0.70 ± 1.04	*520.000*	-4.074	<0.001
1st Day: 24 Hours	0.00 ± 0.00	1.90 ± 1.74	*320.000*	-5.709	<0.001
2nd Day: 36 Hours	0.00 ± 0.00	4.28 ± 1.49	*0.000*	-8.259	<0.001
2nd Day: 48 Hours	0.00 ± 0.00	5.53 ± 1.49	*0.000*	-8.259	<0.001
3rd Day: 60 Hours	0.25 ± 0.67	7.73 ± 2.10	*0.000*	-8.023	<0.001
3rd Day: 72 Hours	0.63 ± 1.03	9.20 ± 2.40	*0.000*	-7.865	<0.001

SD: Standard Deviation; U: Mann-Whitney U test; Z: Standardized test; * Significant at P<0.05. a No statistics were calculated because the standard deviations are 0 for both groups.

Discussion

The current study indicates that the use of a hydrocolloid protective nasal dressing is a highly effective preventive strategy for reducing the incidence and severity of nasal injuries associated with CPAP compared with routine care.

The analysis revealed no statistically significant differences between the study and control groups regarding sex, gestational age, birth weight, or cannula size ($P > 0.05$ for all comparisons). This homogeneity confirms the validity of the randomization method and suggests that further changes in outcomes may be attributed to the intervention instead of confounding factors. In terms of sex distribution, males represented the majority of participants in both groups, a finding comparable to previous studies that reported predominance of males among preterm infants receiving non-invasive ventilation [20,15]. Regarding gestational age, a greater proportion of infants in the study group were classified as the late preterm category, whereas the control group included a higher proportion of the early preterm infant category. However, this difference was not statistically significant. These findings are consistent with those reported by Rezaei et al. and Nguyen et al. [21,22], whose samples had mean gestational ages of approximately 29-30 weeks. Regarding birth weight, infants in the study group were more frequently represented in a higher birth weight category, while those in the control group were more commonly represented in a lower birth weight category; however, the difference was not statistically significant. This distribution is consistent with the birth weight distributions reported by Jamaux et al. and Magalhães et al. [12,23]. In general, the absence of significant baseline differences enhances the internal validity of the study, ensuring that any subsequent differences in nasal injury outcomes can be attributed to the intervention rather than to confounding demographic or clinical factors.

In this context, the results of this study indicated that the application of a protective hydrocolloid nasal dressing was highly effective in reducing nasal injuries associated with CPAP. Infants in the intervention group experienced significantly fewer injuries and showed a marked reduction in injury severity compared to infants receiving routine care. These findings are consistent with those reported by Badr et al. and Xie, both of whom documented significant reductions in nasal injuries after the use of protective nasal dressing [19,25]. The beneficial effect of the hydrocolloid dressing can be explained by its function as a biomechanical barrier that redistributes pressure and reduces frictional forces between the CPAP device interface and the delicate nasal tissues of preterm infants. Furthermore, the dressing likely reduces repetitive shear stress and localized ischemia, thus contributing to the preservation of skin integrity during prolonged respiratory support.

Concerning the incidence of injury, the findings of the present study showed that the application of a hydrocolloid dressing delayed the onset and slowed the progression of nasal injury. Infants in the control group exhibited early development of injury signs following CPAP initiation, with 100% of infants showing signs of injury within the first 36 hours, whereas injury onset in the intervention group occurred substantially later. The appearance of injuries was significantly delayed in the study group, occurring only at 60 hours. Similar findings were reported by Ota et al., who observed early onset of nasal injury following CPAP initiation at approximately 18 hours. The relatively high injury incidence observed in the control group is interpreted in the context of the study assessment methodology. Early-stage tissue changes, including persistent erythema and blanching, were prospectively classified as evidence of injury according to predefined assessment criteria. This approach increased sensitivity for early injury detection and may partially explain the higher cumulative incidence compared with previous studies [24].

The findings related to injury severity demonstrated a highly significant protective effect ($\chi^2 = 80.00$, $P < 0.001$). In the control group, most infants developed moderate or severe nasal injuries, whereas no moderate or severe injuries were observed in the intervention group. Instead, infants in the intervention group either remained free of injury or developed only mild nasal injury. These findings are consistent with previous studies reporting that the use of protective nasal dressings not only reduces the incidence of CPAP-related nasal injury but also limits its progression to more advanced stages [15,19,25]. Clinically, this finding is particularly important because severe nasal injury may lead to ulceration, tissue necrosis, pain, permanent nasal deformity, interruption of respiratory support, and prolonged hospitalization. Therefore, preventing the progression of injury severity may be as clinically meaningful as reducing injury occurrence itself.

Analysis of the timing of peak injury showed that the peak injury in the control group occurred at 72 hours, while in the study group, the peak was also delayed until 72 hours, but with a much lower percentage and milder degrees. This result is consistent with Rezaei et al., who reported that both the first appearance of injury and the peak severity occurred noticeably later in their protective dressing group compared to controls [21]. The observed delay in progression of the intervention group may be attributed to the protective effect of the hydrocolloid dressing, which reduces continuous mechanical pressure and maintains a protective microenvironment over vulnerable skin areas. By minimizing direct contact between the nasal prongs and the skin, the dressing may reduce microvascular damage, thereby delaying the sequence of pathological events leading to tissue damage.

The longitudinal pattern of nasal injury scores over the 72-hour observation period further reinforces the effectiveness of the intervention. Infants in the control group demonstrated a continuous decline in skin integrity over time, whereas injury in the intervention group showed minimal progression and was notably delayed. The findings are consistent with previous studies that emphasized the importance of early preventive skin-care strategies in minimizing device-related pressure injuries among preterm infants [15,19,25].

The examination of CPAP failure revealed that no cases requiring intubation were observed in either group. This finding differs partially from the results reported by Tagliaferro et al., who identified extreme prematurity and severe respiratory distress syndrome as predictors of CPAP failure [26]. The absence of failure in the present study may be related to differences in patient characteristics, respiratory management protocols, or severity of illness among the included infants. Importantly, the use of hydrocolloid dressing did not interfere with CPAP effectiveness, indicating that the intervention is both safe and clinically feasible [26].

An additional finding of importance is that evidence regarding the use of hydrocolloid protective dressings in Iraqi neonatal intensive care settings remains limited. To the best of the authors' knowledge, no published randomized controlled trial has previously evaluated the effectiveness of hydrocolloid protective nasal dressing for preventing CPAP-related nasal injury among preterm infants in Iraq. Therefore, the present study provides locally relevant evidence and may contribute to the development of standardized preventive skin-care protocols in Iraqi NICUs[14] .

Although the findings of the current study are generally consistent with previous international studies, the injury rate observed in the control group was comparatively higher than that reported in some global cohorts. This variability may reflect differences in routine nursing care practices, duration of CPAP exposure, techniques used to stabilize the respiratory interface, availability of preventive protocols, and variations in injury assessment methods in NICU settings. Furthermore, the inclusion of early manifestations of nasal injuries, such as redness and superficial skin damage, broadened the diagnostic criteria, contributing to the higher overall incidence observed in this study compared to clinical trials that only recorded advanced stages of tissue injury. Consequently, while this highly sensitive assessment method ensures early detection of nasal injuries, it may also increase the reported incidence of nasal injury. These findings highlight the importance of implementing standardized preventive skin care strategies and conducting regular nasal assessments in neonatal intensive care practices [20,24].

Several limitations must be considered when interpreting the results of this study. First, the study was conducted in two NICUs only within a single geographic area, which may limit the generalizability of the findings to other healthcare settings. Second, complete blinding was not possible because the protective dressing was visible. Third, the observation period was limited to 72 hours, which may have limited the detection of delayed nasal injuries that could occur during prolonged CPAP therapy. Finally, despite the use of randomization to enhance comparability between groups, the relatively small sample size may limit the accuracy of estimating the effect of the intervention. However, the use of a randomized controlled trial design, standardized assessment, and the clinically relevant results obtained support the validity of the findings.

Conclusion

The hydrocolloid protective nasal dressing evaluated in this study is safe, practical, and effective procedure for reducing nasal injuries in preterm infants receiving CPAP therapy. The findings support the implementation of preventive strategies into neonatal nursing practice. Early application of protective hydrocolloid dressings, along with careful monitoring of the nasal surface, may contribute to safer and more effective delivery of CPAP therapy in NICUs. Future multicenter of randomized controlled trials with large sample size are needed to confirm the current findings. Further research should evaluate longer follow-up periods, compare different dressing materials, assess cost-effectiveness, and investigate whether protective dressings affect long-term cosmetic and developmental outcomes.

Acknowledgments

The authors are grateful to the neonatal intensive care units' staff at Maysan Teaching Hospital for Child and Labor and Al-Hakeem Teaching Hospital for their support during data collection.

Ethical approval

The study received ethical approval from the Committee of Scientific Research Ethics at the University of Baghdad / College of Nursing, and the trial was registered with the Chinese Registry of Clinical Trials (ChiCTR2600118941).

Funding

The study did not receive any financial support from public, commercial, or other organizations.

Conflict of Interest

The authors did not mention any conflict of interest related to this study.

Data availability

The datasets used and analyzed in this study are available from the corresponding author upon reasonable request.

Author Contributions

AKM contributed to conceptualizing and designing the study, collecting data, conducting statistical analysis, interpreting results, writing the manuscript, and critically revising the manuscript, while AQM contributed to the study design and supervised the research process. Both authors read and approved the final version of the manuscript, meet the ICMJE criteria for authorship, and agree to be accountable for all aspects of the work.

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