IMPACT OF RESPIRATORY PHYSIOTHERAPY IN HOSPITALIZED INFANTS WITH ACUTE BRONCHIOLITIS

Impacto da fisioterapia respiratória em bebés internados com bronquiolite aguda

Impacto de la fisioterapia respiratória en bebés hospitalizados con bronquiolitis aguda

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ABSTRACT

Background: acute bronchiolitis can cause significant morbidity due to increased respiratory effort. Treatment is supportive, including oxygen therapy, hydration, and nasal clearance, with no recommendation for the use of bronchodilators, corticosteroid therapy, or respiratory physiotherapy. **Objectives:** to evaluate the effect of respiratory physiotherapy in hospitalized infants with acute bronchiolitis, considering the existing controversies regarding its use. **Methodology:** in this retrospective observational cohort study, data from 67 infants hospitalized between 2019 and 2022 at a level I public hospital were analyzed. Approximately 44% underwent physiotherapy, using both conventional and modern techniques. **Results:** physiotherapy did not reduce the length of hospitalization or the need for oxygen therapy. However, infants who underwent physiotherapy received less antibiotic therapy but more corticosteroid therapy, which may be related to the severity of the cases. No adverse effects associated with physiotherapy were observed. **Conclusion:** respiratory physiotherapy in infants with bronchiolitis is safe; however, the results suggest that its prescription should be carefully considered, as the lack of standardized protocols and the variety of techniques limit the generalization of the findings. Future research should apply uniform protocols, evidence-based techniques, and take clinical severity into account to evaluate the effectiveness of the intervention.

Keywords: bronchiolitis; respiratory therapy; hospitalization; infant

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RESUMO

Enquadramento: a bronquiolite aguda pode causar morbilidade significativa pelo aumento do esforço respiratório. O tratamento é de suporte, incluindo oxigenoterapia, hidratação e desobstrução nasal, não estando recomendado o uso de broncodilatadores, corticoterapia ou fisioterapia respiratória. **Objetivos:** avaliar o efeito da fisioterapia respiratória em bebés internados com bronquiolite aguda, considerando as controvérsias existentes sobre o seu uso. **Metodologia:** neste estudo observacional retrospetivo de coorte, foram analisados dados de 67 lactentes internados entre 2019 e 2022 de um hospital público de nível I. Aproximadamente 44% realizaram fisioterapia, utilizando tanto técnicas convencionais como técnicas modernas. **Resultados:** a fisioterapia não reduziu o tempo de internamento nem a necessidade de oxigenoterapia. Todavia, os lactentes que realizaram fisioterapia receberam menos antibioterapia, mas mais corticoterapia, o que pode estar relacionado com a gravidade dos casos. Não ocorreram efeitos adversos associados à fisioterapia. **Conclusão:** a fisioterapia respiratória em bebés com bronquiolite é segura, no entanto, os resultados sugerem que a sua prescrição deve ser cuidadosamente ponderada, uma vez que a falta de protocolos padronizados e a diversidade de técnicas limitam a generalização dos resultados. Futuras pesquisas devem aplicar protocolos uniformes, técnicas baseadas em evidência e considerar a gravidade clínica para avaliar a eficácia da intervenção.

Palavras-chave: bronquiolite; terapia respiratória; hospitalização; bebé

RESUMEN

Marco contextual: la bronquiolitis aguda puede causar morbilidad significativa por el aumento del esfuerzo respiratorio. El tratamiento es de soporte e incluye oxigenoterapia, hidratación y desobstrucción nasal, sin recomendar broncodilatadores, corticoterapia ni fisioterapia respiratoria. **Objetivos:** evaluar el efecto de la fisioterapia respiratoria en lactantes hospitalizados con bronquiolitis aguda, considerando las controversias sobre su uso. **Metodología:** en este estudio observacional retrospectivo de cohorte se analizaron datos de 67 lactantes hospitalizados entre 2019 y 2022 en un hospital público de nivel I. El 44% recibió fisioterapia, con técnicas convencionales y modernas. **Resultados:** la fisioterapia no redujo la duración de la hospitalización ni la necesidad de oxigenoterapia. Sin embargo, los lactantes que recibieron fisioterapia recibieron menos antibioterapia pero más corticoterapia, lo que puede estar relacionado con la gravedad de los casos. No se observaron efectos adversos asociados a la fisioterapia. **Conclusión:** la fisioterapia respiratoria en lactantes con bronquiolitis es segura; no obstante, los resultados sugieren que su prescripción debe considerarse cuidadosamente, ya que la falta de protocolos estandarizados y la variedad de técnicas limita la generalización de los hallazgos. Futuros estudios deben aplicar protocolos uniformes, técnicas basadas en evidencia y considerar la gravedad clínica para evaluar su eficacia.

Palabras clave: bronquiolitis; terapia respiratoria; hospitalización; bebé

INTRODUCTION

Bronchiolitis is an acute injury of the bronchioles caused by a viral infection in infants under 24 months of age, with a peak incidence between 2 and 6 months. It is characterized by acute inflammation, edema, and necrosis of the epithelial cells lining the small airways, leading to increased mucus production and obstruction of the smaller-caliber airways. The most frequent etiology is the Respiratory Syncytial Virus (RSV), which does not grant long-term immunity, making reinfection common. Other responsible viruses include rhinovirus, metapneumovirus, influenza, adenovirus, coronavirus, and parainfluenza.

Clinically, it is characterized by a prodromal period of 2 to 3 days of coryza and cough, followed by signs of respiratory distress such as nasal flaring, polypnea, and chest wall indrawing, which indicate increased ventilatory work. Pulmonary auscultation may reveal crackles, rhonchi, or wheezing, generally without a decrease in vesicular murmur. Despite being a self-limiting disease, it causes significant morbidity in infants under 6 months and those with chronic diseases due to increased respiratory effort and changes in sleep and feeding patterns.

The diagnosis is clinical; radiological or analytical studies are recommended only for cases with severe respiratory distress or signs of complication, such as potential progression to acute respiratory failure or apnea.

Inpatient treatment principles consist of supplemental oxygen (if SatO2 < 90%), fluid therapy, nasal clearance, and parental guidance. Routine use of bronchodilators (e.g., salbutamol) or systemic corticosteroids is not recommended. The utility of some adjuvant interventions, such as respiratory physiotherapy, remains uncertain, justifying the need for further research in this area.

BACKGROUND

International recommendations (Ralston et al., 2014) do not yet advocate for the routine use of physiotherapy; however, most of these guidelines and reviews are based on studies involving conventional techniques like percussion and vibration. Furthermore, the heterogeneity of the techniques evaluated in various studies limits the interpretation of their efficacy, although their use has been considered safe to date. Nonetheless, there appears to be a benefit related to the need for airway clearance through manual techniques aimed at removing secretions (Gomes & Donadio, 2018). Given the existing controversies regarding the benefit of respiratory physiotherapy in infants with acute bronchiolitis, a knowledge gap remains concerning its true clinical impact. Thus, the main objective of this study is to evaluate the effect of an intervention using both conventional and modern physiotherapy techniques on reducing the length of hospitalization and the need for oxygen therapy. Additionally, it aims to investigate its association with antibiotic and corticosteroid therapy, the perception of clinical improvement by healthcare professionals, and any adverse effects, compared to no intervention, in infants under 2 years old hospitalized with a diagnosis of acute bronchiolitis.

METHODOLOGY

Study Type

A retrospective observational cohort study comparing two groups: infants who received respiratory physiotherapy and those who did not.

Sample

The inclusion criteria considered infants up to 24 months of age, admitted to the Pediatric Department of a level I public hospital between January 2019 and December 2022, with a diagnosis of Acute Bronchiolitis. The diagnosis was established by specialist physicians based on clinical signs and symptoms, including the presence of coryza, cough, fever, increased respiratory rate, and other signs of respiratory distress, changes in breastfeeding/feeding patterns, and auscultatory changes such as wheezing and crackles.

The exclusion criteria were: severe disease requiring transfer to a central hospital, early discharge at the parents' request, reason for admission unrelated to respiratory infection, and age over 24 months. After consulting the individual clinical records of a total of 92 infants hospitalized with a diagnosis of Acute Bronchiolitis during the established period, 25 were excluded for meeting at least one of the exclusion criteria described above.

Context

To conduct the study, the clinical records of the selected infants were consulted, and the following data were collected: reason for admission, risk factors for severe disease, age, viral agent, instituted therapy (including the use of respiratory physiotherapy), need for supplemental oxygen, and duration of hospitalization. The request for physiotherapy collaboration was made by the physician.

Physiotherapy sessions were performed daily (on business days only), always by the same physiotherapist, and began on the same day as the request. The physiotherapy techniques were applied based on individual clinical, imaging, and pulmonary auscultation assessments. Both conventional and modern techniques were utilized (see Table 1).

Table 1

Physiotherapy techniques: classification and description

Category	Technique	Description / Mechanism	Reference
Conventional	**Postural drainage**	Positioning the infant to use gravity to mobilize secretions toward the main bronchus	Hilling et al., 1991
	Vibro-compression (manual/ mechanical)	Manual vibrations applied by the therapist to mobilize secretions by modifying mucus rheology. (Limit: human hand generates up to 8 Hz; thixotropy occurs between 25–35 Hz).	Aparecida et al., 2016
	Nasal and oral aspiration	Direct removal of secretions; provides immediate respiratory relief, though not always necessary.	Gomes et al., 2016
Modern	**Expiratory Flow Increase (IFE)**	Variation of expiratory flow to remove distal secretions (slow movement) and move them to larger airways to be eliminated by cough.	Postiaux et al., 2006
	Provoked Cough (PC)	Mechanical stimulus of extrathoracic tracheal receptors (gentle pressure with index finger or thumb) triggers a reflex cough.	da Costa Rocha et al., 2024
	Compression–decompression	Manual pressure on the lower third of the thorax increases forced expiratory volume; sudden decompression favors lung re-expansion and bronchial hygiene.	Presto & Presto, 2007

	Prolonged Slow Expiration (PSE)	Thoracic-abdominal pressure initiated at the end of spontaneous expiration until residual volume; ↑ tidal volume, ↓ respiratory rate.	Rochat et al., 2012
	Retrograde Rhinopharyngeal Clearance (RRC)	Removal of secretions from the rhinopharynx coordinated with forced inspiration; applied passively.	Abreu et al., 2021

As percussion techniques are currently discouraged (Roqué-Figuls et al., 2023) and obsolete (due to increased risk of injury and intrathoracic pressure with possible small airway collapse) (Aparecida et al., 2016), they were not used. Education was also provided to caregivers regarding respiratory exercises during the hospitalization period.

Minimization of Bias

Data were obtained from clinical records to reduce recall bias. Technical uniformity was ensured by having the same physiotherapist perform all sessions using techniques adapted to each clinical situation.

Study variables

Primary outcomes: reduction in hospitalization time and supplemental oxygen needs. Secondary outcomes: antibiotic/corticosteroid use and perception of improvement by professionals.

Statistical analysis

Initially, a global data analysis was performed using simple statistics to allow for a better interpretation of the results. For the statistical analysis of the data, the Statistical Package for the Social Sciences software (SPSS, v.29.0, Chicago, IL, USA) for Windows was used. A p-value of less than 0.05 was considered statistically significant. For continuous variables, data distribution was assessed using the Shapiro-Wilk test. Results are presented as median (interquartile range) for variables with a non-normal distribution. For comparison between groups, the non-parametric Mann-Whitney U test was used for continuous variables, while the chi-square test was employed for categorical variables. The association between physiotherapy and the categorical variables under study was tested by assessing risk estimation through the calculation of odds ratios. The association between the duration of physiotherapy and the continuous variables under study was evaluated by the strength of the correlations between them using the Spearman correlation coefficient test for the group of patients who underwent physiotherapy. To evaluate the influence of physiotherapy and physiotherapy duration (independent variables) on the other variables under study (dependent variables), binary logistic regression was used for categorical variables, and linear regression was used for continuous variables. For these regression model analyses, the RSV variable was transformed into a binary variable, excluding non-tested cases, and the continuous variables were transformed into data with a normal distribution using the Templeton method (Templeton, 2011).

Ethics

The study was approved by the Ethics Committee of a Local Health Unit in central Portugal.

RESULTS

A total of 67 infants were included out of an initial 92, with 25 being excluded for meeting the exclusion criteria. Of the 67 infants analyzed, 58 were tested for

RSV, showing positivity in 62% of the cases (36 positive cases). The majority of cases (65%) occurred between December and February (see Table 2).

Table 2

Distribution of hospitalizations by year and month

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	4	3	4	1	1	0	0	0	0	1	0	5	19
2020	10	7	0	0	0	0	0	0	0	0	0	0	17
2021	0	0	0	0	0	0	0	2	0	3	1	3	9
2022	3	0	0	0	0	2	0	1	1	2	4	9	22
Total	17	10	4	1	1	2	0	3	1	6	5	17	

As shown in Table 3, approximately 34% (n=23) presented risk factors for severe disease (such as age under 12 weeks, history of prematurity, underlying cardiopulmonary disease, or immunodeficiency). Furthermore, approximately 44% of the evaluated infants underwent physiotherapy (n=30), and 83% (n=25) demonstrated clinical improvement (namely a reduction in adventitious sounds upon auscultation or improvement in signs of respiratory distress), documented in the inpatient clinical records.

The continuous variables under study, age, duration of physiotherapy, duration of oxygen therapy, and duration of hospitalization all presented non-normal data distributions ($p < 0.001$ for all). When comparing the cases that underwent physiotherapy with those that did not, significant differences were observed in antibiotic therapy, corticosteroid therapy, duration of oxygen therapy, and duration of hospitalization. All other parameters under study showed no differences between the groups. The cases that underwent physiotherapy received less antibiotic therapy but more corticosteroid therapy than the cases that did not undergo physiotherapy. The duration of oxygen therapy and hospitalization was longer in cases that underwent physiotherapy

Table 3

Descriptive data of the cohort according to respiratory physiotherapy

		Total	Physiotherapy		
		(*n*=67)	No (*n*=37)	Yes (*n*=30)	*p*
Reason for admission	ARDS	16; 23,9	9; 24,3	7; 23,3	
(*n;* %)	0,1	20; 29,9	8; 21,6	12; 40,0	
	0,1; 11	1; 1,5	0	1; 3,3	
	0,1; 2	3; 4,5	2; 5,4	1; 3,3	
	0,1; 0	1; 1,5	1; 2,7	0	
	0,2	12; 17,9	8; 21,6	4; 13,3	
	0,3	1; 1,5	1; 2,7	0	
	0,4	2; 3,0	2; 5,4	0	

	0,5	1; 1,5	1; 2,7	0	
	0,7	1; 1,5	0	1; 3,3	0,489
	0,9	1; 1,5	0	1; 3,3	
	hypoxemia	1; 1,5	1; 2,7	0	
	1,2	3; 4,5	1; 2,7	2; 6,7	
	1,3	1; 1,5	0	1; 3,3	
	2,3	1; 1,5	1; 2,7	0	
	3,6	1; 1,5	1; 2,7	0	
	prematurity	1; 1,5	1; 2,7	0	
Risk Factors	no	44; 65,7	27; 73,0	17; 56,7	0,162
(*n;* %)	yes	23; 34,3	10; 27,0	13; 43,3	
RSV	not tested	9; 13,4	6; 16,2	3; 10,0	0,753
(*n;* %)	negative	22; 32,8	12; 32,4	10; 33,3	
	positive	36; 53,7	19; 51,4	17; 56,7	
Antibiotics (*n;* %)	no	20; 29,9	6; 16,2	14; 46,7	0,007
	yes	47; 70,1	31; 83,8	16; 53,3	
Corticotherapy	no	26; 38,8	21; 56,8	5; 16,7	<0,001
(*n;* %)	Yes	41; 61,2	16; 43,2	25; 83,3	
Physiotherapy	no	37; 55,2	-	-	-
(*n;* %)	yes	30; 44,8			
Oxygen Therapy (*n;* %)	no	10; 14,9	7; 18,9	3; 10,0	0,308
	yes	57; 85,1	30; 81,1	27; 90,0	
Age (months) median (IQR)		10 (5 – 15)	11 (5 – 15)	8,5 (4,8 – 16)	0,975
Physiotherapy duration (days) median (IQR)		0 (0 – 3)	-	3 (3 – 4)	-
Oxygen Therapy duration (days) median (IQR)		3 (1 – 4)	2 (1 – 4)	4 (2 – 4)	0,019
Hospital stay duration (days) median (IQR)		5 (4 – 7)	4 (3 – 6,5)	6 (5 – 7)	0,011

As shown in Table 4, infants who underwent physiotherapy had a lower probability (0.221 times) of having used antibiotic therapy and a higher probability (6.563 times) of having used corticosteroid therapy compared to infants who did not undergo physiotherapy. No significant associations (odds ratios) were found between physiotherapy and risk factors, RSV, or oxygen therapy.

Table 4

Association (Odds ratio) between respiratory physiotherapy and the remaining categorical variables (n = 67)

		Odds Ratio Physiotherapy (No/Yes)	95% IC	
Risk Factors	Yes	2,065	0,742 – 5,747	no association
RSV*	Positive	1,074	0,370 – 3,112	no association

Antibiotherapy	Yes	0,221	0,071 – 0,685	significant association
Corticotherapy	Yes	6,563	2,058 – 20,928	significant association
Oxygen Therapy	Yes	2,100	0,493 – 8,944	no association

The duration of physiotherapy is inversely and significantly correlated with the infants' age, but shows significantly positive correlations with the durations of oxygen therapy and hospitalization (see Table 5).

Table 5

Correlation between physiotherapy duration and continuous variables (n=30)

Physiotherapy Duration		
Versus	*r*	*p*
Age	-0,562	0,001
Oxygen Therapy Duration	0,392	0,032
Hospitalization	0,625	<0.001

In Table 6, statistically significant binary logistic regression models were observed (χ^2 = 7,431; p = 0,006 and χ^2 = 4,061; p = 0,006, respectively), which explain 14.9% and 8.3% of the variance in antibiotic therapy, correctly classifying 70.1% of the cases. In the first model, it is observed that infants who underwent physiotherapy had a lower probability (0.221 times) of having used antibiotic therapy. Statistically significant binary logistic regression models were also observed (χ^2 = 11,846; p < 0,001 and χ^2 = 7,012; p = 0,008, respectively), which explain 22.0% and 13.5% of the variance in corticosteroid therapy, correctly classifying 68.7% of the cases.

In the first model, it is found that infants who underwent physiotherapy had a higher probability (6.562 times) of having used corticosteroid therapy. In the second model, the increase in the duration of physiotherapy is also associated with this increase. For RSV and oxygen therapy, no statistically significant models were observed to explain their variance, considering the independent variables Physiotherapy or its duration.

Table 6

Predictive models with physiotherapy or its duration as independent variables

Dependent Variable	Predictor χ^2; p	Nagelkerke R^2	Correct Classification (%)	Independent Variable	B	E.P.	Wald	p	β
RSV*	0,017; 0,896	0,000	62,1	Physiotherapy	0,071	0,543	0,017	0,896	1,074
				(constant)	0,460	0,369	1,553	0,213	1,583
	1,951; 0,162	0,045	62,1	Duration of Physiotherapy	0,203	0,150	1,818	0,178	1,225
				(constant)	0,193	0,343	0,316	0,574	1,213

Antibiotherapy	7,431; 0,006	0,149	70,1	Physiotherapy	-1,509	0,577	6,838	0,009	0,221
				(constant)	1,642	0,446	13,557	<0,001	5,167
	4,061; 0,044	0,083	70,1	Duration of Physiotherapy	-0,202	0,119	2,869	0,090	0,817
				(constant)	1,234	0,353	12,211	<0,001	3,434
Corticotherapy	11,846; <0,001	0,220	68,7	Physiotherapy	1,881	0,592	10,110	0,001	6,562
				(constant)	-0,272	0,332	0,672	0,413	0,762
	7,012; 0,008	0,135	68,7	Duration of Physiotherapy	0,357	0,157	5,154	0,023	1,429
				(constant)	-0,040	0,316	0,016	0,900	0,961
Oxygen Therapy	1,071; 0,301	0,028	85,1	Physiotherapy	0,742	0,739	1,007	0,316	2,100
				(constant)	1,455	0,420	12,020	<0,001	4,286
	1,587; 0,208	0,041	85,1	Duration of Physiotherapy	0,227	0,211	1,161	0,281	1,255
				(constant)	1,445	0,403	12,869	<0,001	4,242

In the case of hospitalization duration, statistically significant models were observed having physiotherapy or its duration (positively) as predictive variables (see Table 7).

Table 7

Linear regression models with Physiotherapy or its duration as predictors

Dependent Variable	Adjusted Model R^2; *p*	Inependent Variable (predictor)	B	E. P.	β	t	*p*
Age_N	-0,015; 0,936	(constant)	10,567	1,052		10,048	<0.001
		Physiotherapy	0,127	1,572	0,010	0,081	0,936
	0,200; 0,009	(constant)	23,990	4,818		4,979	<0.001
		Physiotherapy duration:_N	-1,939	0,686	-0,478	-2,826	0.009
Oxygen Therapy Duration_N	0,191; <0,001	(constant)	2,147	0,338		6,348	<0.001
		Physiotherapy	2,064	0,510	0,451	4,046	<0.001
	0,093; 0,063	(constant)	0,945	1,734		0,545	0,590
		Physiotherapy duration_N	0,493	0,254	0.356	1,972	0,063
Hospitalization_N	0,105; 0,005	(constant)	3,907	1,042		3,750	<0.001
		Physiotherapy	4,538	1,545	0,345	2,936	0,005
	0,393; <0,001	(constant)	1,188	1,641		0,724	0,475
		Physiotherapy duration_N	1,023	0,234	0,644	4,378	<0.001

In all evaluated infants, healthcare professionals reported a clinical perception of improvement, reflected by a reduction in signs of respiratory distress, improvement in auscultatory parameters, and a

decrease in the amount of drained secretions. Improvements in appetite and sleep patterns were also noted. These observations reflect subjective clinical assessments, which were not quantified by objective measures.

It is important to note that no adverse effects were observed in the infants included in the study who underwent respiratory physiotherapy.

DISCUSSION

In this study, the effects of respiratory physiotherapy on reducing the length of hospitalization and the need for oxygen therapy were evaluated in infants under 2 years of age hospitalized for bronchiolitis. We found that the duration of oxygen therapy and hospitalization was longer in cases that underwent physiotherapy. However, physiotherapy is not always initiated on the date of admission, and some infants only begin sessions after weaning from oxygen therapy, which indicates that the duration of oxygen therapy may reflect greater clinical severity rather than the effect of physiotherapy. We also observed that these infants received less antibiotic therapy but more corticosteroid therapy. The need for antibiotic therapy is evaluated by the pediatrician based on clinical and laboratory factors that are possible predictors of bacterial superinfection, generally before the start of physiotherapy (which is only performed in the absence of fever). On the other hand, corticosteroid therapy, although not recommended in the treatment of bronchiolitis (Ralston et al., 2014), is frequently prescribed when signs of increased respiratory distress are present. Thus, it is expected that some infants referred for physiotherapy due to more exuberant symptoms are also under corticosteroid therapy. The synergistic effect of using physiotherapy and corticosteroid therapy was not evaluated; therefore, it is not possible to conclude whether the association of the two therapies is clinically beneficial. Furthermore, there are no robust clinical studies specifically evaluating the combination of these two interventions in bronchiolitis, as most evidence addresses each approach in isolation, without investigating synergistic effects.

Since conventional techniques were also applied throughout the study, it was not possible to conclude whether there was a benefit in reducing hospitalization time. According to Roqué-Figuls et al. (2023), in a Cochrane systematic review, conventional respiratory physiotherapy techniques such as percussion, vibration, and postural drainage do not reduce the length of stay, the need for oxygen, or readmissions, and may cause discomfort and crying. Some of these techniques have also been associated with severe adverse effects, such as atelectasis, vomiting, or distress (Aparecida et al., 2016; Rochat et al., 2012).

On the other hand, modern techniques (such as slow expiratory techniques) have shown a reduction in the severity of bronchiolitis, mainly in infants with moderate bronchiolitis, based on low-certainty evidence. However, no beneficial effect has been demonstrated in other clinical outcomes, such as reduction in hospitalization time, oxygen requirements, use of bronchodilators, or perception of improvement by parents (Gajdos et al., 2010; Ralston et al., 2014; Sánchez Bayle et al., 2012).

Despite not observing a reduction in hospitalization time or the need for supplemental oxygen, the data suggest that the techniques may be associated with a clinical perception of improvement, based on

subjective assessments reported by healthcare professionals during the study period. This clinical improvement was also observed in a randomized clinical study by González-Bellido et al. (2021), which investigated changes in the Acute Bronchiolitis Severity Scale (Wang score) and oxygen saturation immediately after a respiratory physiotherapy intervention, using techniques that included prolonged slow expiration, cough at the end of inspiration, and nasal and oral clearance, compared to a control group that received no treatment. It was demonstrated that the intervention group showed a considerable reduction in the Wang Scale compared to the control group.

In this study, several limitations were identified during its implementation.

The clinical evaluation of bronchiolitis is inherently complex due to the high individual variability of the disease and the lack of consensus on the best instruments for assessing severity (Gomes & Donadio, 2018). The use of the Acute Bronchiolitis Severity Scale (Wang score) could have reduced this limitation, allowing for an objective quantification of initial severity and a more uniform comparison between patients.

Additionally, significant heterogeneity was observed between the studied groups. Variables such as the need for antibiotics, duration of oxygen therapy, and days of hospitalization differed between groups, potentially affecting the interpretation of effects attributed to respiratory physiotherapy. This heterogeneity is reinforced by the fact that there is no institutional protocol for referral to physiotherapy. The decision depended exclusively on the evaluation by the responsible pediatrician, without standardized severity criteria, contributing to a non-homogeneous sample and a lack of direct correspondence between clinical severity and the performance of physiotherapy. The variability in the timing of the start of sessions, determined by the date of the request for collaboration, also constitutes a confounding factor that may influence the disease progression.

The choice of respiratory physiotherapy techniques also presented relevant limitations. The selection of maneuvers depended on the professional's training, service protocols, and individual clinical assessment. Thus, different techniques were applied based on clinical, imaging, and pulmonary auscultation assessments, without the evaluation being standardized through the inclusion of the Wang score. This methodological heterogeneity limits the comparability of the results and aligns with the limitations already described in the literature (Gomes & Donadio, 2018). It is also important to mention that although all interventions were performed by the same physiotherapist—which may have reduced variations in execution—this circumstance prevents the generalization of the results to other professionals or techniques.

Another relevant limitation was the decrease in the number of recorded cases in 2020 and 2021, a consequence of the COVID-19 pandemic, which reduced the incidence of bronchiolitis and, consequently, the sample size, affecting the statistical power of the study.

In light of these limitations, it is considered essential to create a referral protocol for respiratory physiotherapy in infants with bronchiolitis, based on objective clinical criteria such as the Wang score. The standardization of inclusion criteria, associated with the prior definition

of the techniques to be applied, would allow for the formation of comparable groups and more robust results. Additionally, the inclusion of modern techniques, which have demonstrated greater efficacy compared to conventional techniques, is recommended (González-Bellido et al., 2021).

It is also suggested that future data collection include a stratification of patients based on the therapy already instituted, minimizing the bias associated with prior exposure to antibiotics, corticosteroid therapy, or oxygen therapy. Finally, it would have been pertinent to evaluate the involvement of caregivers in performing respiratory exercises taught by the physiotherapist, as the possibility of only one daily session on business days may limit the global impact of the intervention.

CONCLUSION

Respiratory physiotherapy proved to be safe, with no recorded adverse effects; however, the results suggest that its prescription should be carefully considered, as the absence of standardized protocols, as well as the heterogeneity of the applied techniques, limits the generalization of the findings.

Future research should include standardized referral protocols, prioritize the use of modern techniques, and consider an objective stratification of clinical severity to allow for more robust conclusions regarding the efficacy and the role of respiratory physiotherapy in the treatment of acute bronchiolitis.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

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