Effect of Applying Acupressure on the Clinical Outcomes of Critically Ill Children with Respiratory Tract Infections: An Integrative Nursing Approach

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Abstract

Background: Respiratory tract infections are heterogeneous and complex group of diseases that require pharmaceutical interventions with undesirable side effects. Thus, integration of acupressure in the care of children with respiratory problems may be effective with regard to management of respiratory distress and prevention of medicinal treatment side effects. **Aim**: To investigate the effect of applying acupressure on the clinical outcomes of critically ill children with respiratory tract infections. **Method:** Quasi-experimental, pre-posttests, research design was carried out at the Pediatric Intensive Care Unit of El-Shatby University Hospital in Alexandria, Egypt. Subjects were 60 eligible children who were assigned into two equal groups. The control group received the routine care of the unit only whereas the study group received acupressure in addition to routine care. **Findings**: Degree of dyspnea decreased dramatically among the study group after three days of acupressure as 56.7% were not troubled at all by dyspnea compared to only 3.3% of children in the control group. Regarding degree of respiratory impairment, all children in study group experienced mild respiratory impairment in the 2nd and 3rd days of the study period (100% in each) compared to the control group (23.3% and16.7% respectively) with significant statistical differences (p= 0.000 in each day). **Conclusion and recommendations:** Integrating acupressure with conventional medical therapy could decrease the severity of dyspnea and enhance pulmonary functioning. In that sense, acupressure was proved to be promising in improving respiratory problems among children with respiratory tract infections. Accordingly, pediatric intensive care nurses can accelerate the improvement of those children using such non-pharmacological approach with the pharmacological one.

Keywords: Acupressure, Critical illness, Respiratory tract infections, Intensive Care Units, Pediatric, Complementary Therapies

1. Introduction

Respiratory Tract Infections (RTIs) are one of the leading causes of death among children in many developing countries (World Health Organization [WHO] & United Nations Children's Fund, 2013). Worldwide, about 3.8 million children aged less than five years died due to RTIs (WHO, 2018). In Egypt (2014), Demographic Health Survey reported that 14% of children under five years had symptoms of an acute RTIs as well pneumonia was responsible for 15% of under five deaths (Ministry of Health and Population [MOHP] et al., 2015).

Respiratory tract infections are a complex group of diseases caused by a wide range of pathogens. Management of RTIs is typically achieved through pharmaceutical interventions that relax the airway muscles, remove secretions, and decrease inflammation. At times, these medications may cause side effects (Cazzola& Matera, 2012). Additionally, therapeutic measures as pulmonary hygiene may induce discomfort for some children (Holland et al., 2013). Therefore, healthcare providers search for other measures that can relieve respiratory symptoms without inducing side effects. In this regard, the National Center for Complementary and Integrative Health (NCCIH, 2018) of the National Institutes of Health referred to complementary therapies including acupressure as healthcare interventions that are used to supplement conventional medical treatment (Lin et al., 2020).

Acupressure is an integral part of a 4000-years-old philosophy of medicine that is known as traditional Chinese medicine (Lin et al., 2020). The basic idea underlying acupressure is that disorders are related to the flow of "Qi" which is thought to be the energetic life force moving through the body along a network of pathways called meridians (Stux et al., 2012). Acupressure refers to the massage of acupoints and meridians with fingertips or knuckles to release the blocked or deficient Qi as well as reduce excess energy if present (Stux et al., 2012). Acupressure can relax respiratory muscles and improve pulmonary function through producing local and systemic anti-inflammatory effects by activation of the cholinergic anti-inflammatory pathway (Chi et al., 2020; He et al., 2020).

Integrating acupressure into healthcare settings poses greater challenges for pediatric intensive care nurses who require specialized training (Fasolino et al., 2019). Pediatric intensive care nurses are key persons involved in the caring of children with RTIs. So, it is a must to equip them with innovative evidence in pediatric healthcare as well as increase their awareness regarding the safety and efficacy of integrative therapies as acupressure (Wopker et al., 2020).

2. Significance of the study:

Problem

Despite the effectiveness of conventional therapies among children with respiratory infections, they have side effects including but not limited to palpitations, dizziness, and depleted respiratory muscles.

What is already known

Pediatric intensive care nurses are in the best position to integrate complementary therapies with traditional ones. Acupressure was effective in similar studies but in relation to pain and palliative care. Likewise, these studies included older age groups.

What this study adds

Integration of acupressure in the care plan of children with respiratory infections is a promising approach to improve the quality of provided care.

3. Aim of study.

The *aim* of the current study was to evaluate the effectiveness of acupressure application on the clinical outcomes among children with RTIs.

4. Hypotheses

The *hypotheses* of this study were as follows:

- Children who receive acupressure exhibit better clinical outcomes than those who do not.
- Children who receive acupressure exhibit higher pulmonary function, less respiratory impairment, and less dyspnea severity than those who do not.

Operational definition

Clinical outcomes in this study were ***defined operationally*** as measurable changes in health and functioning that result from applying acupressure for critically ill children with RTIs. They were measured in terms of dyspnea severity score and respiratory assessment score that includes the presence of scalene muscle contraction, suprasternal retractions and wheezing as well as levels of air entry and oxygen saturation.

5. Materials & Method

5.1. Study Design

A quasi-experimental, pre-posttests research design was used. It was conducted based on TREND - Transparent Reporting of Evaluations with Non-randomized Designs statement http://www.equator-network.org/ (Des Jarlais et al., 2004).

5.2. Setting and participants

The study was carried out in the Pediatric Intensive Care Unit (PICU) of El-Shatby University Hospital in Alexandria, Egypt. The unit consists of 3 rooms with capacity of 9 beds.

The sample size was estimated using G*Power (version 3.1.9.7). The minimum sample size was 52 based on an effect size of 0.80 with a power of 80% and a statistically significant level of 0.05. So, a sample of 66 children aged from 3-6 years were included in this study. However, children who were attached to a mechanical ventilator or had neurological disorders were excluded. **Sixty** children were eligible and fit to the inclusion criteria as well as their guardians agreed upon their participation as illustrated in **Figure-1**. Subjects were assigned randomly into two equal groups by simple random sampling technique. Each group consisted of 30 children as follows; the control group received the routine care of the PICU only whereas the study group received acupressure in addition to PICU routine care. Data were initially collected from the control group and then from the acupressure group.

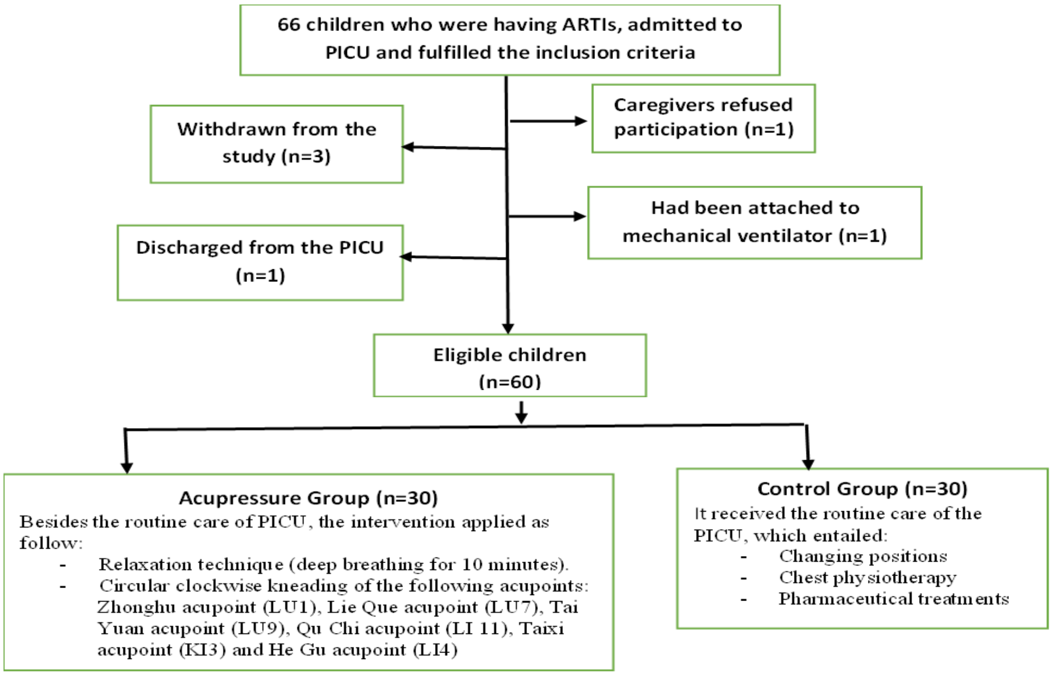

Figure 1: Flow chart of participants' recruitment process

5.3. Tools

Two tools were used for data collection. Tool one namely *Pediatric Respiratory Assessment Measure Scale*. This tool was developed by Ducharme et al. (2008). It is a 12-point clinical scoring rubric that captures children's respiratory difficulty using a combination of scalene muscle contraction (0-2), suprasternal retractions (0-2), wheezing (0-3), air entry (0-3) and oxygen saturation (0-2). The total score of the respiratory assessment is ranged from 0 to 12. Scores from 0-3 represent mild respiratory impairment, scores from 4-7 denote moderate respiratory impairment while scores from 8-12 designate severe respiratory impairment. The internal consistency coefficient of this scale was Cronbach's α=0.71 (**Figure-2**). Demographic and clinical data of children such as age, sex, diagnosis, the onset of symptoms, and previous hospitalization were attached to this tool.

PRAM (Pediatric Respiratory Assessment Measure)				
	Score	Score	Score	Score
Signs	0	1	2	3
Suprasternal retractions	Absent		Present	
Scalene muscle contractions	Absent		Present	
Air entry	Normal	Decreased at bases	Widespread decrease	
Wheezing	Absent	Expiratory only	Inspiratory and expiratory	Audible without stethoscope/silent chest with minimal air entry
Oxygen Saturation	≥95%	92-94%	<92%	

Figure 2: Pediatric Respiratory Assessment Measure Scale

Tool two namely *Pediatric Dyspnea Scale (PDS)*. This scale was adopted from Khan et al. (2009) to determine a subjective rating of dyspnea symptoms by asking the child "How much trouble breathing are you having?". The scale incorporates three components: (1) a faces scale like the Wong-Baker scale to estimate the overall sense of wellness or discomfort, (2) a "chest tightness" graphic adapted with permission from the Dalhousie Dyspnea Scale, and (3) a series of color-coded descriptions of the extent of breathing difficulties. The PDS is scored from 1 through 7 where 1 indicates “No trouble at all” in breathing and 7 indicates “Very much trouble”. Children choose one column of responses based on what most closely matches their symptoms. Then, a score of 1 through 7 is assigned accordingly (**Figure-3**).

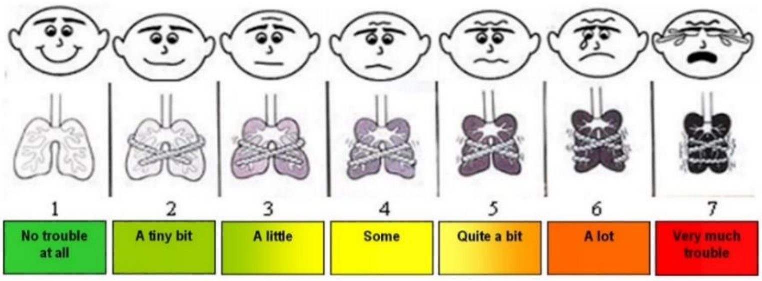

Figure 3: Pediatric Dyspnea Scale

6. Data collection

A pilot study was conducted on six children with RTIs to test the research tools' clarity, feasibility, and applicability. Those children were excluded from the total study subjects. Children’s characteristics and clinical data were extracted from their hospital records for the two groups. Baseline degrees of dyspnea and pulmonary function were assessed and documented for the two groups in the morning shift before performing acupressure using tools I and II. Children in the control group received the routine care of the PICU, which entailed changing positions, chest physiotherapy besides pharmaceutical treatments.

For acupressure group: Acupressure was performed twice daily in the morning (9:00 am) and evening shifts (4:00 pm) for three consecutive days by certified researchers. Cun measurement was estimated based on each child's fingers by using a measuring tape to determine the location of selected acupoints. The researchers started with relaxation technique by asking the child to take deep breathing for 10 minutes. Then, every acupoint was pressed and kneaded by the researcher’s thumb in a circular clockwise motion (Doğan & Taşcı, 2020; Zhang et al., 2020). The selected acupoints included (**Figure-4**):

- Zhonghu acupoint (LU1) is 6 Cun lateral to the anterior midline of the chest in the first intercostal space (Figure 4a).
- Lie Que acupoint (LU7) which is located 1.5 Cun above the wrist crease (Figure 4b).
- Tai Yuan acupoint (LU9) in the rest crease between the radial bone and 1st metacarpal bone (Figure 4b).
- Qu Chi acupoint (LI 11) at the lateral end of the transverse cubital crease at the middle of the connection between the bicep’s tendon and the lateral epicondyles of the humerus (Figure 4c).
- Taixi acupoint (KI3) which is in the depression midway between the tip of the medial malleolus and the attachment of the achilles tendon (Figure 4d).
- He Gu acupoint (LI4) in the middle of the second metacarpal bone on the radial side (Figure 4c).

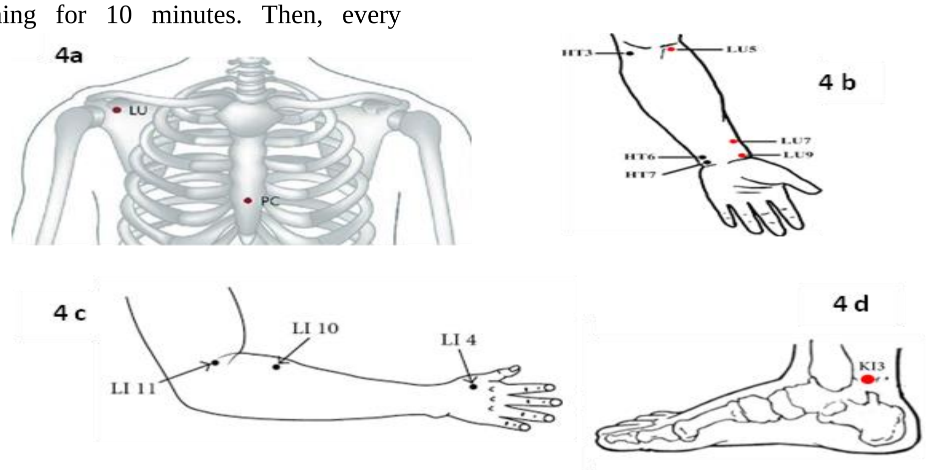

Figure 4: Acupressure points: 4a (Kim et al., 2018), 4b (Cheng et al., 2021), 4c (Matsubara et al., 2011) and 4d (Wang et al., 2016)

In case of incidental distress, the intervention was discontinued. The Degree of dyspnea and pulmonary function were assessed for the two groups every day throughout the three days of the study period in the evening shift (6:00 pm) using tools I & II. Data were collected over 9 months from November 2020 till the end of July 2021.

7. Ethical consideration.

The protocol has been approved by the Ethical Research Committee review board of Faculty of Nursing, Alexandria University on the 7th of September 2020. Official permission for conducting the study was obtained from the director of the previously mentioned setting. Researchers received specialized training in the field of acupressure at the Faculty of Physical Education for Girls, Alexandria University. The researchers approached guardians of children who matched the inclusion criteria and explained the aim of the study, benefits, and possible risks of participation. Guardians' free decision to voluntarily participate in the study or withdraw at any time was also emphasized. After their agreement, written informed consent was obtained. Confidentiality of the obtained data was assured, and participants' anonymity was respected. Privacy was also maintained during the implementation of the study.

8. Data Analysis

The Statistical Package for Social Sciences (SPSS) version 23 was utilized for data analysis. Descriptive statistics including numbers, percentages, mean and standard deviation, were used to describe characteristics and clinical data of children. Kolmogorov-Smirnov test was used to check the normality of study variables, and it showed that they were normally distributed. In Analytical statistics, Chi-square and Fisher Exact tests were used to compare the two groups regarding respiratory assessment measure and degree of dyspnea. All the statistical analyses were considered significant at $P < 0.05$.

9. Results

Table 1 portrays characteristics and clinical data of children with respiratory tract infection. Regarding children's age, 60% of children in the control group and 56.7% of those in the study group were from 3 to less than 4 years with mean age 3.966±1.286 and 3.950±1.147 years respectively. Male children constituted nearly three-quarters of both the control and study groups (76.7% and 70.0% respectively). Concerning diagnosis, 56.7% of the control group and 43.3% of the study group were diagnosed with pneumonia. Nearly two-thirds of children in the control and study groups were not hospitalized before (66.7% and 60.0% respectively).

Table 2 reveals the effect of acupressure on the degree of dyspnea among children with respiratory tract infection. Nearly half of children in the control and study groups were suffering from some dyspnea (56.7% and 46.7% respectively) as baseline data. However, the degree of dyspnea decreased dramatically among children of the study group after three days of acupressure as more than half of children (56.7%) were not troubled at all by dyspnea compared to only 3.3% of children in the control group. Moreover, 43.3% of children in the control group were having a little dyspnea compared to only 10% of children in the study group. Significant statistical difference was found between the two groups after application of acupressure ($p = 0.000$).

Table 3 discloses the effect of acupressure on oxygen saturation among children with respiratory tract infection. Before application of acupressure, oxygen saturation was from 92% to 94% among 63.3% and 56.7% of children in the control and study groups respectively. After three days of acupressure, oxygen saturation increased to equal or more than 95% among 86.7% of children in the study group compared to only 3.3% of children in the control group. Significant statistical differences were found between the two groups in the 2nd and 3rd days of the study period ($p = 0.000$ in each).

Effect of acupressure on suprasternal retraction among children with respiratory tract infection is illustrated in Table 4. Amazingly, it is apparent from the table that children of the study group exhibited improvement regarding suprasternal retraction after application of acupressure. Hence, none of children in the study group experienced suprasternal retraction in the 3rd day of the study period compared to 36.7% of children in the control group. There were evident significant statistical differences between the two groups in the 1st, 2nd, and 3rd days of the study period ($P = 0.001$, $P = 0.000$ and $P = 0.000$ respectively).

Table 5 illustrates effect of acupressure on scalene retraction among children with respiratory tract infection. A great decline of scalene retraction was observed among children of the study group from

20.0% as base line data to only 6.7% and 3.3% in the 1st and 2nd days of study period respectively. While the percentage of children who had scalene retraction in the control group was 43.3% in the 1st day of the study period and decreased slightly to 40.0% in the 2nd day. At the 3rd day of the study period, no one of children in the study group had scalene retraction compared to 33.3% of children in the control group. Significant statistical differences were found between the two groups in the three days of the study period (p= 0.000 in each).

Table 6 demonstrates effect of acupressure on air entry among children with respiratory tract infection. As a base-line data, air entry was decreased at bases for nearly two-thirds of children in the study and control groups (60.0% and 63.3% respectively). All of children in the study group had normal air entry in the 2nd and 3rd days of the study period (100% in each). While 83.3% and 76.7% of children in the control group respectively had experienced decreased air entry at bases. Significant statistical differences were found in the three days of the study period (p= 0.000 in each).

Table7 clarifies effect of acupressure on wheezing among children with respiratory tract infection. Most of children in the study group (96.7%) were not suffering from wheezing at the 2nd day of the study period compared to only 3.3 % of children in the control group as more than three-quarters of them were suffering from expiratory wheezing (76.7%). Regarding the third day of the study period, all of children in the study group didn't experience wheezing at all compared to 33.3% of the control group. Significant statistical differences were found between the two groups in the 1st, 2nd, and 3rd days of the study period (p= 0.020, p= 0.000 and p= 0.000 respectively).

Table 8 presents effect of acupressure on pulmonary function among children with respiratory tract infection. More than three-quarters of children in the study group (76.7%) and 56.7% of those in the control group experienced moderate respiratory impairment as a base line data. Though, majority of children in study group (93.3%) experienced mild respiratory impairment compared to 23.3% of children in control group in the 1st day of the study period. Moreover, all children in study group experienced mild respiratory impairment in the 2nd and 3rd days of the study period (100% in each) compared to the control group (23.3% and16.7% respectively). Significant statistical differences were found between the two groups in the three days of the study period (p= 0.000 in each).

10. Discussion

The demand for using acupressure amongst pediatric patients has gained substantial momentum over recent years due to its effectiveness without side effect profile which adds to its popularity (O'Regan & Filshie, 2010). Acupressure plays an imperative role in multidisciplinary approaches to management of health problems. As a therapeutic modality, it contributes to relieving discomfort and symptoms of countless disorders such as RTIs (Lee & Frazier, 2011; NCCIH, 2018).

Dyspnea is a prevalent symptom in a wide variety of disorders that is most often treated with pharmaceuticals and medical devices. Although medical therapies are essential, they often cannot address the psychosocial and behavioral factors that exacerbate dyspnea and its deleterious effects on children's quality of life (Parshall et al., 2012). One of the exclusive findings of the present study is the dramatic effect acupressure on the degree of dyspnea among children of the study group as more than half of them were not troubled at all by dyspnea compared to very small percentage of the control group. Furthermore, all of children in the study group had normal air entry and didn't experience wheezing at all in the third day of acupressure compared to the control group who experienced diminished air entry at bases and expiratory wheezing. These findings might be related to activation of myelinated neural fibers by acupressure that stimulate the hypothalamus and pituitary gland to release β-endorphins. The analgesic effect of β-endorphins may improve the effectiveness of breathing movements. Moreover, the muscle-relaxant effect of β-endorphins could enable deeper breathing movements (Maa et al., 2007). Similarly, Suzuki et al. (2012) and El-Saadawy (2013) reported that acupressure was effective as an adjuvant therapy to improve dyspnea in patients with respiratory disorders.

Effect of acupressure on stabilization of oxygen saturation may be contributed by the improvement of dyspnea and relaxation of respiratory muscles that enhance the breathing (El-Saadawy, 2013). This goes with the current findings as oxygen saturation among most of the study group increased significantly to more than 95% after three days of acupressure compared to a very small percentage of the control group. Bayrakçı-Tunay et al. (2010) stated that touch and massage including acupressure could improve blood and lymphatic circulation besides vasodilation of the arterioles which increase the oxygen and nutrients supply to the tissues. Exerting these effects, acupressure improves respiratory functions and, thereby, resulting in increased oxygen saturation. Correspondingly, El-Saadawy (2013) concluded that acupressure group had statistically significant improvement in relation to dyspnea and respiratory rate than the control group. Alsac and Polat (2019) also found higher oxygen saturation in the acupressure and the massage groups.

The rehabilitative effect of the acupressure on enhancing pulmonary function was proven by the present study. Where, all children in the study group experienced mild respiratory impairment in the third day of the study period compared to the control group as more than three quarters of them were suffering from moderate respiratory impairment. As well, all children of the study group exhibited significant improvement regarding suprasternal and scalene retractions in the third day of the study period. These findings could be justified by relaxation of the respiratory muscles in addition to local and systemic anti-inflammatory effects of acupressure because of the activation of cholinergic anti-inflammatory pathway (He et al., 2020). Similar results were reported by Chi et al. (2020) who proved that acupuncture and acupressure are safe and effective interventions for respiratory rehabilitation during the treatment of COVID-19 or after weaning from the ventilator. Additionally, Zhang et al. (2020) reported that acupressure improves the respiratory function of patients with lung disease. Given that, the present study merely shed light on the drastic effects of acupressure on respiratory disorders in pediatric health care facilities.

Table 1: Characteristics and Clinical Data of Children with Respiratory Tract Infection

Characteristics and Clinical data		Control Group (n=30) No. (%)	Study Group (n=30) No. (%)	Significance	
Age/ years	3-	18(60.0)	17(56.7)	X^2= 8.50	p=0.13
	4-	4(13.3)	5(16.7)		
	5-6	8(26.6)	8(26.7)		
Mean±SD		3.966±1.286	3.950±1.147		
Gender	- Male	23 (76.7)	21(70.0)	X^2= 0.34	p=0.55
	- Female	7(23.3)	9(30.0)		
Residence	- Urban	10(35.7)	18(64.3)	X^2= 4.28	p=0.038
	- Rural	20(62.5)	12(37.5)		
Diagnosis*	- Pneumonia	17(56.7)	13(43.3)	X^2= 5.08	p=0.27
	- Bronchial asthma	12(40.0)	9(30.0)		
	- Bronchitis	6(20.0)	11(36.7)		
	- Bronchiolitis	7(23.3)	6(20.0)		
Onset of symptoms/ days	- Less than 7	19(63.3)	19(63.3)	X^2= 1.22	p=0.87
	- 7-	5(16.7)	7(23.3)		
	- 14-21	6 (20.0)	4(13.3)		
Associated symptoms*	- Dyspnea	30(100.0)	29(96.7)	F^{ET}=5.04	p=0.53
	- Cyanosis	22(73.3)	21(70.0)		
	- Productive cough	18(60.0)	18(60.0)		
	- Non-productive cough	7(23.3)	5(16.6)		
	- Chest wheezing	7(23.3)	4 (13.3)		
	- Chest tightness	0(0.0)	1(3.3)		
Mothers' first action when observing the child's symptoms*	- Visiting physician / hospital	28(93.3)	25(83.3)	F^{ET}=3.17	p=0.36
	- Trying to relieve symptoms using popular recipes	2(6.7)	7(23.4)		
Current medications*	- Antibiotics	18(60.0)	14 (46.7)	F^{ET}=7.32	p=0.19
	- Bronchodilators	12(40.0)	13(43.4)		
	- Corticosteroids	12(40.0)	8(26.7)		
	- Mucolytic and expectorant	0 (0.0)	3(10.0)		
Previous hospitalization	- Yes	10(33.3)	12(40.0)	X^2= 0.28	p=0.59
	- No	20(66.7)	18(60.0)		

*** More than one answer**

X^2 = Chi Square test F^{ET} = Fisher's Exact Test *Significant at $P < 0.05$

Table 2: Effect of Acupressure on Degree of Dyspnea among Children with Respiratory Tract Infection.

Degree of Dyspnea	Before		After	
	Control Group (n=30)	Study Group (n=30)	Control Group (n=30)	Study Group (n=30)
	No. (%)	No. (%)	No. (%)	No. (%)
- **No trouble at all (1)**	0(0.0)	0(0.0)	1(3.3)	17(56.7)
- **A tiny bit (2)**	2(6.7)	4(13.3)	3(10.0)	8(26.7)
- **A little (3)**	5(16.7)	6(20.0)	13(43.3)	3(10.0)
- **Some (4)**	17(56.7)	14(46.7)	11(36.7)	1(3.3)
- **Quite a bit (5)**	3(10.0)	3(10.0)	2(6.7)	1(3.3)
- **A lot (6)**	2(6.7)	1(3.3)	0(0.0)	0(0.0)
- **Very much trouble (7)**	1(3.3)	2(6.7)	0(0.0)	0(0.0)
Mean±SD	4.033±1.066	3.900±1.268	3.333±0.884	1.700±1.022
Significance	F^{ET}= 1.715		**F^{ET}= 31.411**	
	p= 0.887		**p= 0.000*** **	

X^2 Pearson Chi-Square F^{ET}: Fisher Exact Test Significant at: *P value <0.05 **P value <0.01, ***P value < 0.001

Table 3: Effect of Acupressure on Oxygen Saturation among Children with Respiratory Tract Infection.

Oxygen Saturation		Control Group (n=30)	Study Group (n=30)
		No. (%)	No. (%)
Base line data	▪ ≥95	0(0.0)	0(0.0)
	▪ 92%-94%	19(63.3)	17(56.7)
	▪ <92%	11(36.7)	13(43.3)
Significance		**X^2**= 0.278 p= 0.598	
First Day	▪ ≥95	1(3.3)	7(23.3)
	▪ 92%-94%	23(76.7)	18(60.0)
	▪ <92%	6(20.0)	5(16.7)
Significance		**X^2**= 5.201 p= 0.074	
Second Day	▪ ≥95	1(3.3)	24(80.0)
	▪ 92%-94%	29(96.7)	6(20.0)
	▪ <92%	0(0.0)	0(0.0)
Significance		**F^{ET}= 36.274 p= 0.000*** **	
Third Day	▪ ≥95	1 (3.3)	26(86.7)
	▪ 92%-94%	22(73.3)	4(13.3)
	▪ <92%	7(23.3)	0(0.0)
Significance		**X^2= 42.61 p=0.000*** **	

X^2: Chi-square Test F^{ET}: Fisher Exact Test Significant at: *P value <0.05, **P value <0.01, ***P value < 0.001

Table 4: Effect of Acupressure on Suprasternal Retraction among Children with Respiratory Tract Infection.

Suprasternal Retraction		Control Group (n=30)	Study Group (n=30)
		No. (%)	No. (%)
Base line data	▪ Absent	14(46.7)	7(23.3)
	▪ Present	16(53.3)	23(76.7)
Significance		**X^2**=3.774 p=0.052	
First Day	▪ Absent	14(46.7)	27(90.0)
	▪ Present	16(53.3)	3(10.0)
Significance		**F^{ET}=13.017 p=0.001*** **	
Second Day	▪ Absent	14(46.7)	29 (96.7)
	▪ Present	16(53.3)	1(3.3)
Significance		**F^{ET}= 21.818 p=0.000*** **	
Third Day	▪ Absent	19(63.3)	30(100.0)
	▪ Present	11(36.7)	0(0.0)
Significance		**F^{ET}=22.259 p= 0.000*** **	

X^2: Chi-square Test F^{ET}: Fisher Exact Test Significant at: *P value <0.05, **P value <0.01, ***P value < 0.001

Table 5: Effect of Acupressure on Scalene Retraction among Children with Respiratory Tract Infection

Scalene Retraction		Control Group (n=30)	Study Group (n=30)
		No. (%)	No. (%)
Base line data	Absent	17 (56.7)	24(80.0)
	Present	13(43.3)	6(20.0)
Significance		X^2=3.774 p=0.052	
First Day	Absent	17(56.7)	28 (93.3)
	Present	13 (43.3)	2 (6.7)
Significance		**F^{ET}= 16.596 p= 0.000*** **	
Second Day	Absent	18(60.0)	29(96.7)
	Present	12(40.0)	1(3.3)
Significance		**F^{ET}= 16.596 p= 0.000*** **	
Third Day	Absent	20(66.7)	30(100.0)
	Present	10(33.3)	0(0.0)
Significance		**F^{ET}= 30.000 p= 0.000*** **	

X^2: Chi-square Test F^{ET}: Fisher Exact Test Significant at: *P value <0.05, **P value <0.01, ***P value < 0.001

Table 6: Effect of Acupressure on Air Entry among Children with Respiratory Tract Infection

Air Entry		Control Group (n=30)	Study Group (n=30)
		No. (%)	No. (%)
Base line data	Normal	0(0.0)	1(3.3)
	Decreased at bases	19 (63.3)	18 (60.0)
	Widespread decrease	11 (36.7)	11 (36.7)
Significance		X^2=1.027 p=0.598	
First Day	Normal	0 (0.0)	21 (70.0)
	Decreased at bases	19 (63.3)	9 (30.0)
	Widespread decrease	11 (36.7)	0 (0.0)
Significance		**X^2 =35.571 p= 0.000 *** **	
Second Day	Normal	0(0.0)	30(100.0)
	Decreased at bases	25(83.3)	0 (0.0)
	Widespread decrease	5(16.7)	0 (0.0)
Significance		**X^2=60.000 p=0.000*** **	
Third Day	Normal	7 (23.3)	30(100.0)
	Decreased at bases	23 (76.7)	0 (0.0)
	Widespread decrease	0 (0.0)	0 (0.0)
Significance		**F^{ET} 37.297 p= 0.000*** **	

X^2: Chi-square Test F^{ET}: Fisher Exact Test Significant at: *P value <0.05, **P value <0.01, ***P value < 0.001

Table 7: Effect of Acupressure on Wheezing among Children with Respiratory Tract Infection

Wheezing		Control Group (n=30)	Study Group (n=30)
		No. (%)	No. (%)
Base line data	Absent	0(0.0)	0(0.0)
	With Expiration	23 (76.7)	17 (56.7)
	With inspiration and expiration	7 (23.3)	13 (43.3)
Significance		X^2=2.700 p=0.100	
First Day	Absent	0 (0.0)	13 (43.4)
	With Expiration	23 (76.7)	10 (33.3)
	With inspiration and expiration	7 (23.3)	7 (23.3)
Significance		**X^2 =49.14 p= 0.020*** **	
Second Day	Absent	1 (3.3)	29(96.7)
	With Expiration	22(73.3)	1 (3.3)
	With inspiration and expiration	7(23.3)	0 (0.0)
Significance		**X^2 =56.129 p= 0.000*** **	
Third Day	Absent	10 (33.3)	30(100.0)
	With Expiration	15(50.0)	0 (0.0)
	With inspiration and expiration	5(16.7)	0 (0.0)
Significance		**X^2 =56.129 p= 0.000*** **	

X^2: Chi-square Test F^{ET}: Fisher Exact Test Significant at: *P value <0.05, **P value <0.01, ***P value < 0.001

Table 8: Effect of Acupressure on Pulmonary Function among Children with Respiratory Tract Infection

Pulmonary Function		Control Group (n=30)	Study Group (n=30)
		No. (%)	No. (%)
Base line data	Mild respiratory impairment	7 (23.3)	1 (3.3)
	Moderate respiratory impairment	17(56.7)	23(76.7)
	Severe respiratory impairment	6(20.0)	6(20.0)
Significance		X^2=5.40 p= 0.067	
First Day	Mild respiratory impairment	7(23.3)	28(93.3)
	Moderate respiratory impairment	17(56.7)	2(6.7)
	Severe respiratory impairment	6(20.0)	0(0.0)
Significance		**F^{ET} =30.44**	**p= 0.000*** **
Second Day	Mild respiratory impairment	7(23.3)	30(100.0)
	Moderate respiratory impairment	23(76.7)	0(0.0)
	Severe respiratory impairment	0(0.0)	0(0.0)
Significance		**F^{ET} =37.30**	**p= 0.000*** **
Third Day	Mild respiratory impairment	5(16.7)	30(100.0)
	Moderate respiratory impairment	25(83.3)	0(0.0)
	Severe respiratory impairment	0(0.0)	0(0.0)
Significance		**F^{ET} =42.86**	**p= 0.000*** **

X^2: Chi-square Test F^{ET}: Fisher Exact Test Significant at: *P value <0.05, **P value <0.01, ***P value <0.001

Limitation of the study

Although the present study adds an important perspective to the already robust literature on this subject, it has limitations related to the long-term effects. So, conducting this study on a larger sample and examining the long-term impacts of such modality would provide more generalizable findings.

11. Conclusion and Recommendation

Non-pharmacological measures together with pharmacological one represents a revolution in treatment of RTIs. In that sense, integrating acupressure with conventional therapy was proved to be promising in improving clinical outcomes of children with respiratory disorders by decreasing dyspnea severity and enhancing pulmonary functioning.

To foster the short-term hospitalization of children with RTIs, there is an immense need for incorporating acupressure into the care protocol of PICUs. Moreover, training programs should be conducted for pediatric nurses and parents to increase their awareness regarding its benefits.

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Disclosures

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