



Impact of nebulisation with chest physiotherapy on level of oxygen saturation among sick children admitted in selected hospital of Udaipur District: A non Randomized Control Trial

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Abstract:

Aim: The aim of the study to assess the impact of nebulisation with chest physiotherapy on oxygen saturation level among sick children. **Methodology:** The sample size taken for the study was 354 with selected respiratory disorders by non randomized convenient sampling technique. Sample was divided in to two groups; one is experimental and second is control group. The experimental group was treated by nebulisation and chest physiotherapy whereas control group was treated by nebulisation alone. A standard semi structured questionnaire and a rating scale was used to assess oxygen saturation level among sick children. Data were analyzed with the help of SPSS 16.0 software. **Results:** In experimental group the mean pre-test respiratory distress score is 1.14 and mean post-test respiratory score is 0.46. The estimated paired 't' value was (14.635), which is significant at $p < 0.05$. This reduction is statistically significant. In control group the mean pre-test respiratory distress score is 1.17 and mean post-test respiratory score is 0.75. The estimated paired 't' value was (8.033), which is significant at $p < 0.05$. This reduction was statistically significant. But we can see that in experimental group the reduction is of 0.678 points which is higher than the reduction score (0.421) of control group. **Conclusion:** It is concluded that children with respiratory problems show better improvement in their oxygen saturation level after administration of nebulisation with chest physiotherapy compare to administration of nebulisation alone.

KEY WORD:

Impact; Nebulisation; Chest Physiotherapy; Postural Drainage; Percussion

Introduction:

Children are the important part of the population and they are the future of Country. Since 1950 the total number of children younger than 15 years of age increased rapidly, from 0.87 billion children to 1.96 billion today. In India, an estimated 26 millions of children are born every year. As per Census 2011, 13% of the population consists by the children (0-6 years) in India. According to National Health Mission 12.7 lakh children die every year before completing 5 years of age in India.

Impaired oxygen saturation level is common symptom with airway obstruction among children diagnosed with asthma, cystic fibrosis, pneumonia, bronchitis ect.

Oxygen saturation refers to the amount of oxygen your child's red blood cells are carrying. If your child is in good health, the majority (95% to 100%) of their red blood cells that have passed through the lungs should be full of, or saturated, with oxygen. If they have a heart condition that prevents the red blood cells (specifically hemoglobin) from picking up oxygen, their saturation level will be lower. This reduced amount of oxygen in the blood is called hypoxemia or cyanosis. People breathing regular air have a saturation of 96% to 98%; anything less than 95% results in hypoxemia, which is cause for concern.

If oxygen levels are found to be low, child will receive oxygen in concentrations higher than would be present in the regular airway breathe. Low oxygen levels may cause your child to act very tired and may indicate respiratory fatigue. Low oxygen and difficulty breathing may force child to thrust his or head backwards with the nose up in the air.

Based on the underlying disease and the person's overall condition several different techniques are used to treat impaired oxygen saturation such as suctioning breathing exercises, chest physical therapy ect.

In my study main intervention is nebulisation with chest physiotherapy. Chest physiotherapy includes postural drainage and percussion.

Nebulisation helps to administer medication directly into respiratory tract for sputum expectoration. It reduces difficulty in bringing out thick tenacious respiratory secretions. Nebulisation increase vital capacity and it relieve dyspnea.

Postural drainage is the positioning techniques that drain secretions from specific segments of the lungs and bronchi into the trachea. Because some patients do not require postural drainage for all lung segments, the procedure must be based on the clinical findings. In postural drainage, the person is tilted or propped at an angle to help drain secretions from the lungs.

Chest percussion involves striking the chest wall over the area being drained. Percussing lung areas involves the use of cupped palm to loosen pulmonary secretions so that they can be expectorated with ease.

The aim of the study to assess the impact of nebulisation with chest physiotherapy on oxygen saturation level among sick children.

Importance of Research Work:

Nirmolia N, Mahanta T, Boruah M, Rasaily R, Kotoky R, Bora R. (2018) conducted a community based cross sectional study to assess the Prevalence and risk factors of pneumonia in under-five children living in slums of Dibrugarh town. Selection was done by probability proportionate to size technique. A total of 624 children were examined by house to house visit. Study results show that prevalence of pneumonia was 16.34%.

G M, K R. (2018) conducted a cross sectional survey to assess the prevalence and associated risk factors of bronchial asthma in children in Santo Domingo, Dominican Republic. Total six hundred children aged 3 to 11 years were selected. Study findings show that the prevalence of asthma was found to be 22.0%. Age, family history of asthma, family history of allergy, exposure to tobacco smoke, and birth order showed statistical significance.

Fekadu G, Teref M, Alemie G. (2014) conducted a community based cross-sectional survey to assess the prevalence of pneumonia among under- five children in Este town and the surrounding rural kebeles, Northwest Ethiopia. A total of 286 households with under-five children were selected by multistage sampling technique, 222 from rural and 64 from the urban. Findings show that the overall two weeks prevalence of pneumonia among under-five children was 16.1%. Researcher concluded that the prevalence of pneumonia among under-five children in the study area was high.

So many studies show that the prevalence rate of respiratory problems is very high in children (Infant-14 years). It is found that respiratory problems are very prone in children. Due to respiratory problems children are not able to attend school regularly. It limits play & physical activity and exercise in children. Children cannot sleep properly due to severity of respiratory problems. It leads to impaired growth and development.

Chest physiotherapy is as mentioned before; a collaborative approach which is intended to improve the physiologic status of a person who is suffering with any pulmonary complications. Studies show that nebulisation with chest physiotherapy is very effective to drain mucus in respiratory problems like pneumonia, bronchitis, cystic fibrosis, atelectasis, asthma etc. So I want to assess the impact of nebulisation with postural drainage and percussion on respiratory conditions among the sick children.

Review of literature:

Catherine R. and Manju Bala Dash (2018) conducted a study to assess the effectiveness of salbutamol vs hypertonic saline nebulisation on breathing pattern among the children with lower respiratory tract infection admitted to the selected hospitals, Puducherry. Quantitative approach and pre and post with two group research design were used. The study samples were 1 month to 12 years children. Salbutamol and Hypertonic Saline nebulisation were given and children were assessed before and at 1 hour after intervention using oxygen saturation level, heart rate and respiratory pattern. The results showed that the post test mean oxygen saturation level was 1.15 ± 0.36 and 1.00 ± 0.00 in group I and II respectively with 't' value of 2.623 ($p < 0.05$) shows that there is a statistically significant difference between group I and II nebulisation toward oxygen saturation level. Researcher concluded that each method of nebulisation i.e. Salbutamol and Hypertonic saline shows significant difference in the post-test oxygen saturation level than pre-test but salbutamol shows better result compared to Hypertonic saline nebulisation.

Maged A. Meawad et. al. (2018) conducted a study to assess the effect of chest physical therapy modalities on oxygen saturation and partial pressure of arterial oxygen in mechanically ventilated patients. 30 patients post MV, their age ranged from 50 to 60 years old were selected in this study. The patients were selected from ICUs of Kasr al Ainy hospital, Faculty of Medicine, Cairo University. The patients received chest physiotherapy (percussion, vibration, manual hyperinflation), positioning and upper and lower limbs exercises. Result of the study shows that increase in Pao₂ and SaO₂ in addition to decreased incidence of chest infection and decreased ICU stay. Researcher concluded that the results of this study support the importance of chest physiotherapy on increasing SaO₂ and Pao₂, decrease ICU duration and decrease health care costs.

Abdelbasset W, Elnegamy T. (2015) conducted a randomized controlled study to evaluate the effect of chest physiotherapy on pediatrics hospitalized with pneumonia in Pediatric University Hospital and Cairo University Hospitals. 50 children aged 29 days to 5 years hospitalized with pneumonia were obtained, 25 were randomly allocated to the study group and 25 to the control group. Results show that there were significant differences in terms of median time to clinical resolution and the study group had greater improvement in respiratory rate (40 to 30 b/m vs 39 to 34 b/m) and in arterial oxygen saturation (93 to 98% vs 93 to 95%) than the control group. Researcher concluded that chest physical therapy showed significant improvements in pediatrics hospitalized with pneumonia.

Lestari N, Nurhaeni N, Chodidjah S. (2018) conducted a quasi experimental study on the combination of nebulisation and chest physiotherapy improved respiratory status in children younger than age five with pneumonia. Pre and post-test nonequivalent control group research design was used. 34 respondents selected by consecutive sampling were divided into two groups: one that received nebulisation and one that received nebulisation with chest physiotherapy. The study results stated that there was a significant mean difference in heart rate, respiratory rate, and oxygen saturation between the control and intervention group ($p=0.000$). Researcher concluded that the combination of nebulisation and chest physiotherapy is more effective than nebulisation only.

Problem Statement:

Impact of nebulisation with chest physiotherapy on oxygen saturation among sick children admitted in selected hospital of Udaipur district (Raj.): A non-Randomized controlled trial

Objective:

1. To assess the effectiveness of nebulisation with chest physiotherapy on level of oxygen saturation among the sick children in experimental group
2. To determine the effectiveness of nebulisation on level of oxygen saturation among sick children in control group.
3. To compare level of oxygen saturation among sick children in experimental group and control group.
4. To find out the degree of association between the post-test level of oxygen saturation with selected demographic variables.

Hypothesis:

H₁: There will be significant difference in the effectiveness of oxygen saturation among sick children who received nebulisation with chest physiotherapy than who received nebulisation alone.

H₂: There is significant association between effectiveness of nebulisation with chest physiotherapy on oxygen saturation with selected demographic variables.

Material and methods:

Research Approach:

The study utilized quantitative research approach.

Research Design:

In this study quasi experimental, with pre-test post-test non-randomized control group research design was used.

VARIABLES:

In this study following variables are present

Independent variable:

Nebulisation with chest physiotherapy is an independent variable in this study.

Dependent variable:

Level of oxygen saturation among sick children is the independent variables.

Socio-demographic variables:

Socio-demographic variables in this study are residence of child, history of passive smoking, family history of respiratory problem, frequency of nebulisation and type of medication used in nebulisation.

Setting:

The study was conducted in Maharana Bhupal Govt Hospital, Udaipur.

Sample:

The samples for study were the sick children who were diagnosed with respiratory problems, admitted in selected paediatric intensive care unit or paediatric medical ward within the age group of infant to 14 years both boys and girls receiving nebulisation with plain normal saline or normal saline with bronchodilator and who fulfil the inclusion criteria.

Sample Size:

The sample size consists of 304 children those who had been diagnosed with respiratory problems. Among those, 152 participants were selected for experimental group and 152 for control group.

Sampling technique:

Non-probability convenient sampling technique was used for sample selection.

Description of the Tool

Semi structured rating scale was used for data collection. Tool consists of two sections.

Section-A: Socio-demographic variables in this study are residence of child, history of passive smoking, family history of respiratory problem, frequency of nebulisation and type of medication used in nebulisation.

Section-B: The semi structures rating scale to assess the level of oxygen saturation. Based on the severity of respiratory conditions, the scoring was described as follows. (Maximum score was 2 and minimum score was 0)**Data Collection Procedure**

For experimental group: Children were nebulised followed by postural drainage and percussion for 20 minutes, (includes 5 minutes percussion) in each position both morning and evening for three days. Standardized 10 positions are practiced to drain secretions from all lobes of the lungs.

For control group: Children were nebulised for 3 days not followed by chest physiotherapy.

Plan for Data Analysis:

Descriptive: Frequency and percentage distribution and Mean

Inferential: t-test, chi square test

RESULTS:**Details of Demographic Variable:**

Allocation of children according to their residence in the experimental group; majority of children (N=91, Percentage=59.9%) belonged to urban area. In the control group; majority of children (N=102, Percentage=67.1%) belonged to rural area.

Distribution of children according to history of passive smoking in experimental group; majority of children (N=122, Percentage=80.3%) were not exposed to passive smoking. In control group; majority of children (N=107, Percentage=70.4%) were not exposed to passive smoking and remaining 29.6% children (N=45) were exposed to passive smoking.

Distribution of children according to family history of respiratory problem in experimental group; majority of children (N=88, Percentage=57.9%) had family history of respiratory problem. In control group; majority of children (N=97, Percentage=63.8%) had family history of respiratory problem.

Distribution of children according to frequency of nebulisation during illness in experimental group; majority of children (N=80, Percentage=52.6%) were nebulised every 6 hours. In control group; majority of children (N=85, Percentage=55.9%) were nebulised every 6 hours.

Distribution of children according to types of medication used in nebulisation in experimental group; majority of children (N= 138, Percentage=90.8%) were nebulised with normal saline with bronchodilator. In control group; majority of children (N= 132, Percentage=86.8%) were nebulised with normal saline with bronchodilator.

Section II: Distribution of children according to level of oxygen saturation among experimental group and control group

A) Frequency and percentage of children according to their level of oxygen saturation in experimental group

Table 4.1: Frequency and percentage of children according to their level of oxygen saturation in experimental group

Level of Respiratory Condition		Pre-test		Post-test	
		Frequency	Percentage	Frequency	Percentage
Experimental Group (N=152)	Normal	17	11.2%	85	55.9%
	Mild-Moderate Distress	97	63.8%	64	42.1%
	Severe Distress	38	25.0%	3	2.0%
Total		152	100%	152	100%

Table no 4.1 depicts the frequency and percentage of children according to their level of oxygen saturation before and after the administration of nebulisation with chest physiotherapy in experimental group.

In pre-test majority of children (N=97, Percentage=63.8%) showed mild to moderate distress, 11.2% children (N=17) showed normal distress and remaining 25% children (N=38) showed severe distress.

In post-test majority of children (N=85, Percentage=55.9%) showed normal distress, 42.1% children (N=64) showed mild to moderate distress and remaining 2% children (N=3) showed severe distress.

In experimental group; we can see reduction in respiratory distress level after giving nebulisation with chest physiotherapy among sick children.

B) Frequency and percentage of children according to their level of oxygen saturation in control group

Table 4.2: Frequency and percentage of children according to their level of oxygen saturation in control group

Level of Respiratory Condition		Pre-test		Post-test	
		Frequency	Percentage	Frequency	Percentage
Control Group (N=152)	Normal	12	7.9%	61	40.1%
	Mild-Moderate Distress	102	67.1%	68	44.7%
	Severe Distress	38	25.0%	23	15.1%
Total		152	100%	152	100%

Table no 4.2 depicts the frequency and percentage of children according to their level of oxygen saturation level before and after the administration of nebulisation with chest physiotherapy in control group.

In pre-test majority of children (N=102, Percentage=67.1%) showed mild to moderate distress, 7.9% children (N=12) showed normal distress and remaining 25% children (N=38) showed severe distress.

In post-test majority of children (N=68, Percentage=44.7%) showed mild to moderate distress, 40.1% children (N=61) showed normal distress and remaining 15.1% children (N=23) showed severe distress.

In control group; we can see slowly reduction in respiratory distress score after giving nebulisation alone.

Section III: Comparison of mean score between pre-test and post-test of level of oxygen saturation among sick children in experimental and control group

Table 4.3: Comparison of mean score between pre-test and post-test of level of oxygen saturation among sick children in experimental and control group							
Respiratory Condition	No of Sick Children	Pre-test Mean±SD	Post-test Mean±SD	Mean Difference	t Value	df	p Value
Experimental Group	152	1.14±.587	.46±.538	.678	14.635	151	.000
Control Group	152	1.17±.549	.75±.702	.421	8.033	151	.000

Note: Significant at p<0.05 level

Table no 4.3 depicts the comparison of mean score between pre-test and post-test level of oxygen saturation among sick children in experimental and control group.

In experimental group the mean pre-test respiratory distress score is 1.14 and mean post-test respiratory score is 0.46. The estimated paired 't' value was (14.635), which is significant at p<0.05. This reduction is statistically significant.

In control group the mean pre-test respiratory distress score is 1.17 and mean post-test respiratory score is 0.75. The estimated paired 't' value was (8.033), which is significant at p<0.01. This reduction was statistically significant.

But we can see that in experimental group the reduction is of 0.678 points which is higher than the reduction score (0.421) of control group. Thus it is evident that children with respiratory problems show better improvement in their level of oxygen saturation after administration of nebulisation with chest physiotherapy compare to administration of nebulisation alone.

Section V : Association between the post-test level of oxygen saturation among sick children in experimental group with selected demographic and clinical variables

Table No: 4.5 Association between the post-test levels of oxygen saturation among sick children in experimental group with selected demographic and clinical variables

Socio demographic and clinical variables		Level of oxygen saturation in Experimental Group			Total	Chi-square			Remark
		More than 92%	80-92%	Less than 80%		χ^2	df	p Value	
		N	N	N					
Residence	Urban	50	39	2	91	0.127	2	.939	Not Significant
	Rural	35	25	1	61				
	Total	85	64	3	152				
History of passive smoking	Yes	11	19	0	30	7.216	2	0.27	Not Significant
	No	74	45	3	122				
	Total	85	64	3	152				
Family History of Respiratory Problem	Yes	53	32	3	88	4.511	2	.105	Not Significant
	No	32	32	0	64				
	Total	85	64	3	152				
Frequency of Nebulisation during illness	Every 2-4 hourly	26	25	2	53	2.517	2	.284	Not Significant
	Every 6-8 hourly	59	39	1	99				
	Total	85	64	3	152				
Type of Medication used in Nebulisation	Plain Normal Saline	8	6	0	14	.311	2	.856	Not Significant
	Normal saline with Bronchodilator	77	58	3	138				
	Total	85	64	3	152				

Table no 4.5 depicts the association between demographic variables and their level of post-test oxygen saturation level in experimental group. Chi-square value is not significant in all of the cases which projects that demographics variables of sick children such as residence of child, history of passive smoking, family history of respiratory problem, frequency of nebulisation and type of medication used in nebulisation have no significant impact on their level of post-test oxygen saturation level.

CONCLUSION:

Results shows that reduction in respiratory distress level is higher in experimental than control group. So we can say nebulisation with chest physiotherapy among sick children is effective than nebulisation alone. It can be seen that in experimental group the reduction is of 0.678 points which is higher than the reduction score (0.421) of control group. Thus it is evident that children with respiratory problems show better improvement in their level of oxygen saturation after administration of nebulisation with chest physiotherapy compare to administration of nebulisation alone. So we can say null hypothesis is rejected and alternative hypothesis is accepted.

In experimental and control group chi-square value is not significant in all of the cases which projects that demographics variables of sick children such as residence of child, history of passive smoking, family history of respiratory problem, frequency of nebulisation and type of medication used in nebulisation have no significant impact on their level of post-test oxygen saturation level so we can say null hypothesis is accepted and alternative hypothesis is rejected.

LIMITATION :

The following points were beyond the control of the investigator.

- Sample was selected only from few areas of Udaipur district.
- The study was confined to 354 subjects, which resulted in reduced power in statistical analysis.
- Initially the children were not cooperative for postural drainage and percussion techniques

RECOMMENDATION :

The investigator recommend the nurses and administrator to provide pamphlets and demonstrate the chest physiotherapy techniques among children with impaired with oxygen saturation level in pulmonology ward, paediatric general ward wards, paediatric intensive care unit and outpatient department.

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