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Research article

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A comparative study to assess the effect of balloon therapy versus spirometry in promotion of respiratory function in children with lower respiratory infection at SMCH

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ABSTRACT

Introduction

The respiratory system is a frequent site of illness in children. Respiratory infection and allergies together are responsible for many disruptions in family life and which force them to miss their school work. Most children have 3 to 5 attacks of acute respiratory infection in each year. The respiratory rate is a valuable clinical sign for diagnosing acute lower respiratory infection in children who cough and breathe rapidly. Blowing balloon exercises these respiratory muscles, a group of muscle interacting to adapt thoracic dimension to certain breathing ages & Spirometry is a device used for the evaluation of lung function with a spirometer. So the present study is to effect of balloon therapy versus Spirometry in promotion of respiratory function in children with lower respiratory infection at SMCH.

Methods

Quasi experimental research pretest posttest design was done in SMCH. Totally 60 samples were selected, in that 30 samples were selected for experimental group I & 30 samples were selected for experimental group II. Purposive Sampling Technique method was used in selecting the samples. Physiological parameters were used to collect data on to assess the effect of balloon therapy versus spirometry in promotion of respiratory function in children with lower respiratory infection.

Result

It is found that balloon therapy was statistically significant at the level of heart rate and O₂ saturation at $p < 0.05$ level between pre and post-test, where the spirometry shows the most significant in the level of respiratory rate when compared to balloon therapy group.

Conclusion

Educational programs in helping the children by teaching them to regard balloon therapy and incentive spirometry on prevention of respiratory problem, improvement of lung function, reduction of length of hospitalization and repeated hospitalization.

INTRODUCTION

Children are major consumers of health care. In India about 35 percent of the total population

is children below 15 years of age. The Good health of these precious members of the society should be ensured as prime importance in all countries.

According by Karl Menninger “What is done to children they will do the society “Children are the wealth of tomorrow [1-5].

About 13% of inpatient death in paediatric ward is due to acute respiratory infection. Most children have 3 to 5 attacks of acute respiratory infection in each year. WHO (2011) shows that by mid-century, morbidity and mortality from respiratory disease will reach record at High levels. The report of “WORLD HEALTH STATISTICS 2011” says that, 235 million people currently suffer from asthma, 90% of COPD deaths occur in Low and middle income countries and > 3 million people died of COPD in 2005.

Lower respiratory tract infection, pneumonia remains that most common infection seen in the community and among hospitalized patients. Respiratory disease is a significant chronic health problem in our society. Chronic respiratory disease is found to be one of the most distressful conditions, badly affecting human life. The Respiratory system is a frequent site of illness in children. Respiratory infection and allergies together are responsible for many disruptions in family life and which force them to miss their school work. Children respond differently to respiratory illness than adults. There are respiratory changes that occur during childhood as new lung tissue continues to form and existing structure changes in shape and function. However, most respiratory conditions are more stressful for children than adult, more often leading to airway obstruction or respiratory failure. In the respiratory tract, lower respiratory tract infection is one of the leading common diseases occur during childhood. Acute infection of the lower respiratory tract may be diagnosed in children of all ages; they tend to occur most frequently in young children who have not yet developed resistance to infectious disease. The infections that occur during the childhood include bronchitis and pneumonia. The respiratory rate is a valuable clinical sign for diagnosing acute lower respiratory infection in children who cough and breathe rapidly. The presence of hyperinflation of the chest wall in drawing identifies more severe diseases. Lower respiratory tract infection is more fatal than upper respiratory infection. Moreover, in 2013, 6.9% of occurred due to respiratory illness which is the leading cause when compared to other diseases. Lower

respiratory tract infection manifests symptoms like wheezing, fever, tachypnea and chest retraction. The infections that occur during the childhood include asthma, bronchitis and pneumonia [6-13].

Infection and inflammation of the lungs is particularly troublesome and is seen in many different forms in children. Other illnesses that occur in the lower respiratory tract, such as wheezing associated lower respiratory infections, asthma and pneumonia. Blowing balloons exercises the respiratory muscles, a group of muscles interacting to adapt thoracic dimensions to certain breathing stages. Basic respiratory muscles are the diaphragm, the internal intercostal and the external intercostal. Steadily blowing up several balloons, one after another, effectively exercises these muscles, building lung capacity and stamina

A Spirometry is a device used for the evaluation of lung function with a Spirometer. It is one of the simplest, most common pulmonary function test and may be necessary for all following reason, including determining how well the lung receive, hold and utilize air, monitor lung diseases, monitor the effectiveness of treatment, determine the severity of lung disease and determine whether the lung disease is restrictive or obstructive.

OBJECTIVES

1. To assess the demographic variables of among children using balloon therapy and Spirometry.
2. To assess the physiological parameters among children with respiratory tract infection before giving balloon therapy and Spirometry.
3. To assess the physiological parameters among children with Lower respiratory tract infection after giving balloon therapy and Spirometry.
4. To compare the physiological parameters among children with Lower respiratory tract infection before and after balloon therapy and Spirometry.

MATERIAL AND METHODS

A sample of 60 children were in the age group of 6 to 12 years. Samples were selected by purposive sampling technique.

Quasi experimental research pretest posttest study was conducted during 01/02/2019-04/05/2019. The official permission was obtained from SMCH to conduct the study. Demographic profile of children, such as age,

sex, religion, weight, education, monthly income, primary caretaker, duration of hospitalization. Physiological parameters which include heart rate, respiratory rate and Oxygen saturation. Respiratory rate was measured by observation, and oxygen saturation was measured by pulse oximetry. The study investigators explained to the children's about the study's objectives, and requirement of consent to participate in the study. The investigators then provided instructions for filling the questionnaire, and then guided the mother. Understanding of each question was checked by asking the mother to repeat the meaning. During the filling of questionnaires, the investigator she helped the mother throughout and helped simplify the meaning of each question, clarifying doubts and checking for completeness of filling up the questionnaire. Paired t test was used to test the association between categorical variables. $P < 0.05$ was taken as statistically significant.

RESULTS

Out of 30 samples 13(44%) samples were coming under type, age group of 6-8 years, 11 (36%) were under the age group of 8-10 years, 6(20%) samples were under the age group of 10-12 years. Regarding gender out of 30 samples, 17(54%) samples were male, 13 (43%) samples were female, regarding religion out of 30 samples 14 (46%) samples were Hindu religion, 8 (27%) samples were Christian, 8 (27%) samples were under Muslim religion. Regarding the weight of a child, out of 30 samples, 6 (20%) samples were in 10-20kg, 16(53%) samples were 20-30kg, 8(27%) samples were in 20-30kg.

Regarding educational qualification out of 30 samples 8(27%) samples were pre-primary, 17(57%) samples were primary school, 5(16%) samples were completed higher school.

Regarding income of family out of 30 samples 1(4%) samples were below 5000, 10(33%) samples were 5001- 10000, 10(33%) samples were 10001-15000, 9(30%) samples were 15001 & above. Regarding Primary caretaker out of 30 samples 18(60%) samples were mothers, 6(20%) were Father, 6(20%) samples were grandparents. Regarding the duration of present hospitalization, out of 30 samples 6 (20%) samples were 2days, 14 (47%) samples were 2-4days. 9 (30%) samples have 1 week, 1 (4%) samples have more than 1 week. In both spirometry and balloon therapy, it is found that balloon therapy was statistically significant at the level of heart rate and O2 saturation at $p < 0.05$ level between pre and post-test, where the Spirometry shows the most significant in the level of respiratory rate when compared to balloon therapy group. So Balloon therapy is more effective than spirometry.

Frequency and distribution of the demographic variable among children using balloon therapy and Spirometry. The children's are in the age group of 6-8 years 13 (44%). Most of the gender are male 17 (57%). Under the religion Hindu's come under 14 (46%). 16 (53%) children are under the weight of 20-30kg. Regarding educational qualification 17(57%) samples were primary school. 10 (33%) were coming in the income of 10001-15000. 18 (60%) samples care taker is mother. 14(47%) children has the history of hospitalization 2-4 days. (TABLE 1).

Table 1: Frequency and distribution of the demographic variable among children using balloon therapy and Spirometry.

S.No	DEMOGRAPHIC VARIABLES	NO	%
1	AGE (In Years)		
	a) 6-8	13	44%
	b) 8-10	11	36%
	c) 10-12	06	20%
2	Gender		
	) Male	17	57%
	) Female	13	43%
3	Religion		
	) Hindu	14	46%
	b) Christian c) Muslim	8	27%
		8	27%

4	Weight of the Child		
	a)10-20kg		
	b)20-30kg	6	20%
	c)30-40kg	16	53%
		8	27%
5	Education qualification		
	) Preprimary	8	27%
	) Primary	17	57%
	)Higherschool	5	16%
6	Income of family		
	a) Below 5000	1	4%
	b)5001-10000	10	33%
	c)10001-15000	10	33%
	d)15001 & above	9	30%
7	Primary care taker		
	) Mother	18	60%
	) Father	6	20%
	)Grandparents	6	20%
8	Duration of present hospitalisation		
	) 2days		
	) 2-4days	6	20%
	) 1 week	14	47%
	d) More than 1 week	9	30%
		1	4%

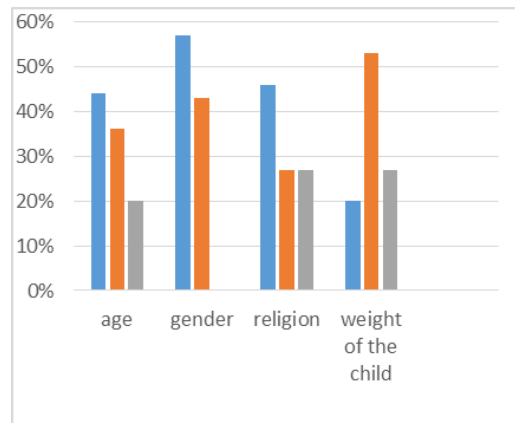


Figure 1: shows the demographic variables among frequency and distribution of the demographic variable among children using balloon therapy and Spirometry.

Table 2: Graphical presentation of mean score and standard deviation score of physiological parameters among children with respiratory tract infection before giving balloon therapy and spirometry (Pretest).

Treatment	Pretest	Mean	Std. Deviation
Spirometry	Heart rate pretest	85.6	6.7
	Respiratory rate pretest	23.1	3.1
	Oxygen saturation rate pretest	94	1.61
Balloon therapy	Heart rate pretest	86.2	6.25
	Respiratory rate pretest	23.8	2.78
	Oxygen saturation rate pretest	94.06	1.48

Table 2: shows the mean score on the level of respiratory parameters among children for spirometry Heart rate (85.6), Respiratory rate (23.1), Oxygen saturation rate (94) and balloon therapy Heart rate (86.2), Respiratory rate (23.8), Oxygen saturation rate (94.06)

Standard deviation on the level of respiratory parameters among children for spirometry Heart rate (6.7), Respiratory rate (3.1), Oxygen saturation rate (1.61) and balloon therapy Heart rate (6.25), Respiratory rate (2.78), Oxygen saturation rate (1.48).

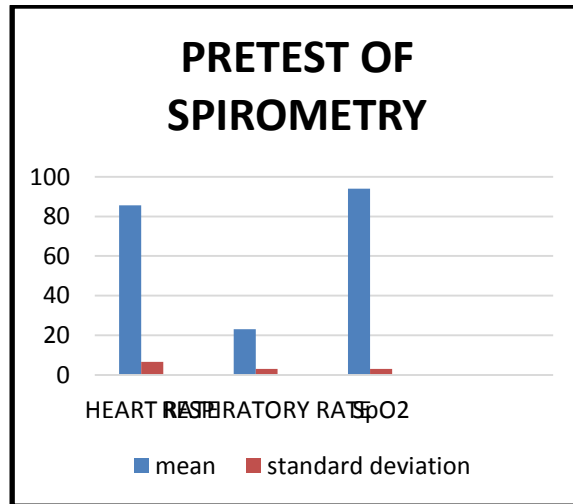


Figure 3: shows mean score and standard deviation score of physiological parameters among children with respiratory tract infection before giving balloon therapy and spirometry (Pretest).

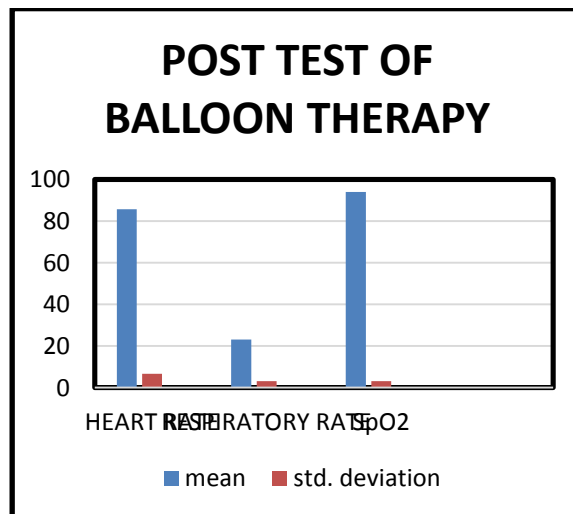


Table 3: shows the mean score on the level of respiratory parameters among children for spirometry Heart rate

Treatment	Post test	Mean	Std. deviation
Spirometry	Heart rate post test	76.06	3.22
	Respiratory rate post test	21.86	2.39
	Oxygen saturation rate post test	97.23	1.63
Balloon therapy	Heart rate post test	74.93	1.88
	Respiratory rate post test	21.6	2.36
	Oxygen saturation rate post test	98	1.55

Table 3: shows the mean score on the level of respiratory parameters among children for

spirometry Heart rate (76.06), Respiratory rate (21.86), Oxygen saturation rate (97.23) and

balloon therapy Heart rate (74.93), Respiratory rate (21.6), Oxygen saturation rate (98) Standard deviation on the level of respiratory parameters among children for spirometry Heart

rate (3.22), Respiratory rate (2.39), Oxygen saturation rate (1.63) and balloon therapy Heart rate (1.88), Respiratory rate (2.36), Oxygen saturation rate (1.55)

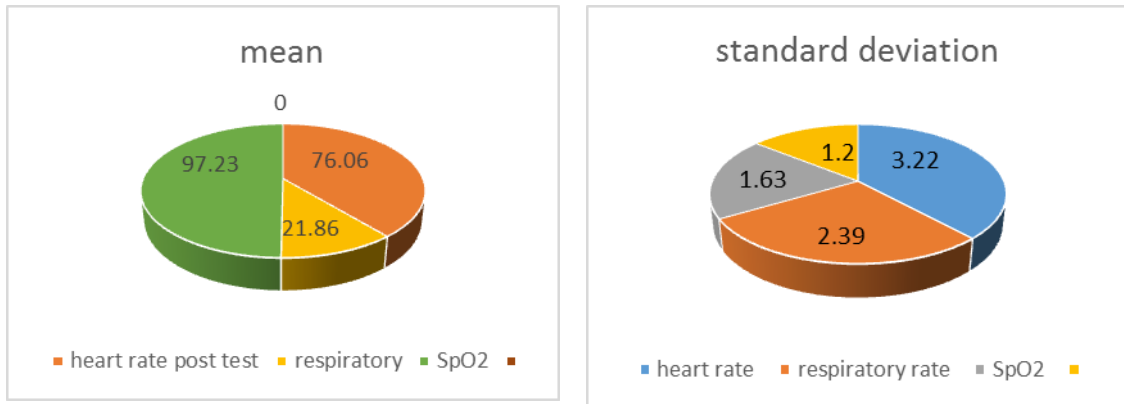


Figure 5: shows mean score and standard deviation score of physiological parameters among children with Lower respiratory tract infection after giving balloon therapy and spirometry (Post-test).

Table 4: Comparison of the pre-test and post-test level of respiratory parameters among children with Lower respiratory tract infection before and after balloon therapy and spirometry

Group	Paired 't' value (Heart rate)	Paired 't' value (Respiratory rate)	Paired 't' value (O2 saturation)
Spirometry	8.31	7.9	6.46
Balloon therapy	10.09	6.73	10.91

Table value, *significant at $p < 0.05$ level

In both spirometry and balloon therapy, it is found that balloon therapy was statistically significant in the level of heart rate and O2 saturation at $p < 0.05$ level between pre and post-test, where the spirometry shows the significant in the level of respiratory rate when compared to

balloon therapy group. So Balloon therapy is more effective than spirometry.

Figure 6 shows, paired 't' value, in spirometry heart rate (8.31), respiratory rate (7.9), O2 saturation (6.46) & balloon therapy heart rate (10.09), respiratory rate (6.73), O2 saturation (10.91).

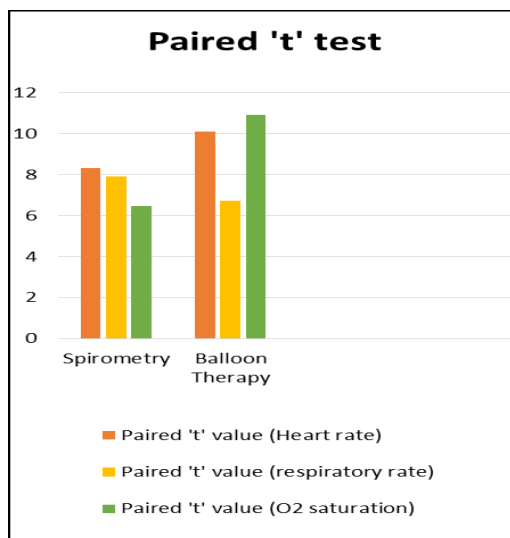


Figure 6: Shows comparison of the pre-test and post-test level of respiratory parameters among children with Lower respiratory tract infection before and after balloon therapy and spirometry

DISCUSSION

The present study is to assess the relation between the balloon therapy and spirometry among lower respiratory tract infection in children, the result indicates that balloon therapy was statistically significant in the level of heart rate and O₂ saturation at $p < 0.05$ level between pre and post-test, where the spirometry shows the significant in the level of respiratory rate when compared to balloon therapy group. So Balloon therapy is more effective than spirometry. Thw study which is similar to findings reported by **Kim, Jin-Seop, Lee & Yeon-Seop., (2012)** who conducted a study to evaluate the effectiveness of balloon blowing exercise on lung capacity. The result showed that a pulmonary function of the balloon-blowing training group significantly improved as compared to those of the non-training group. The study revealed that the balloon-blowing exercise has positive effects on lung function. The present study also supported to the study finding of **Renuka K.** et al. to assess effectiveness of balloon therapy on respiratory status of the patient with lower respiratory tract disorders. There was a highly significant improvement in the pre-test and post-test respiratory rate ($P < 0.001$).

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This was accordance with studies conducted by **Rafaqat A et al.** to compare between Balloon Blowing Exercise and Incentive Spirometry in Patients with Chest Intubation after Trauma. In balloon therapy pre and post treatment differences are found statistically significant. Pre and post-test of respiration rate (27.43 ± 01.98) and (25.01 ± 01.79) respectively at p value 0.0001. Pre and post-test of oxygen saturation (90.73 ± 02.34) and (94.36 ± 01.71) respectively at p value 0.0001 which is statistically significant. This was accordance with studies conducted by **Arunima Sreelatha** also reported that in balloon therapy, it was found that the difference was statistically significant ($P \leq 0.05$) between pre (23.980 ± 1.4006) and post-test (23.060 ± 1.6835) respiratory rate, Oxygen saturation pre and post-test (97.38 ± 3.384) and (98.31 ± 3.983) respectively at $p \leq 0.05$ which was statistically significant.

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