

Effectiveness of Balloon Blowing Therapy and Incentive Spirometry in Promotion of Pulmonary Function among Dyspnea Patients in Selected Hospitals at Bagalkot

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Abstract

Original Research Article

Background: Dyspnea, or shortness of breath, is a common and distressing symptom in patients with various respiratory conditions. Non-pharmacological interventions such as Balloon Blowing Therapy (BBT) and Incentive Spirometry (IS) are often used to improve pulmonary function; yet comparative effectiveness remains inadequately explored.

Objectives:

1. To assess the pre-test scores of pulmonary functions among dyspnea patients in both experimental and control groups.
2. To determine the effectiveness of BBT and IS in the promotion of pulmonary function.
3. To find the association between pre-test scores and selected socio-demographic and clinical variables.

Methods: A True-experimental study was conducted at HSK Hospital and Research Centre, Navanagar, Bagalkote. A total of 60 dyspnea patients were selected through purposive sampling 30 in the experimental group (BBT) and 30 in the control group (IS). Data were collected using the Borg Dyspnea Scale and clinical parameters (pulse rate, respiratory rate, SPO₂). Descriptive and inferential statistics, including paired and independent t-tests and chi-square tests, were used for data analysis.

Results:

- **Pre-test Scores:** The experimental group had a higher mean dyspnea score (M=3.53, SD=0.62) compared to the control group (M=3.43, SD=0.56).
- **Post-test Scores:** A significant reduction was observed in the experimental group (M=1.96, SD=0.71) compared to the control (M=2.6, SD=0.54).
- **T-Test Analysis:** The paired t-test revealed a significant improvement in both groups (Experimental: t=15.09, Control: t=4.29; p<0.05), with greater improvement in the BBT group.
- **Borg Scale:** The number of patients reporting severe breathlessness dropped from 18 (pre-test) to 0 (post-test) in the experimental group.
- **Association:** Significant associations were found between pre-test scores and variables such as habits, diet, respiratory rate, sleep, chronic respiratory disease, and smoking.

Conclusion: Balloon Blowing Therapy was found to be significantly more effective than Incentive Spirometry in promoting pulmonary function and reducing dyspnea symptoms. It is a simple, low-cost, and non-invasive intervention that can be incorporated into respiratory care for dyspnea patients.

Keywords: Dyspnea, Pulmonary Function, Balloon Blowing Therapy, Incentive Spirometry, Borg Dyspnea Scale, Respiratory Therapy.

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INTRODUCTION

Health, the vital part of the human being to lead a happy life cycle. A person needs to have a balanced diet

and regular exercises. The World Health Organizations states that "Health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" [1].

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Pulmonary health is the health and function of the lungs and respiratory system. It is crucial for overall well-being as the lungs play a vital role in supplying oxygen to the body and removing carbon dioxide. Good pulmonary health involves keeping the lungs clear and free from infection, maintaining good lung capacity and function, and avoiding factors that can damage the lungs such as smoking or exposure to pollutants. The Regular habits of exercise, eating a healthy diet, avoiding smoking, on-time vaccination, regular and early screening for lung cancer, practicing deep breathing and good respiratory hygiene can all maintain and improve pulmonary health [2].

Dyspnea is manifested in different forms, varying from mild breathlessness during physical exertion to severe difficulty in breathing at rest. The sensation may be accompanied by others symptoms such as coughing, wheezing, chest tightness, rapid breathing [4]. Types of dyspnea are the Acute and chronic dyspnea, Exceptional dyspnea, Paroxysmal Nocturnal Dyspnea, platypnea-Orthodeoxia [3].

The COPD prevalence in the eight studies ranged from 2.4% in Southern India to 16.1% in Northern India. The random-effects pooled estimate for COPD prevalence in the Indian population was 7.4% (95% confidence interval: 5.0%-9.8%). The studies showed significant heterogeneity. The heterogeneity test yielded an I² score of 95.5% and $P < 0.001$. The study was done to evaluate the prevalence of COPD among Indian people. The study results showed that in the eight selected studies (pooled sample of 8,569 individuals), the estimated prevalence was 7.4% (95% confidence interval: 5.0%-9.8%), $I^2 = 95.4\%$, $P < 0.001$. Males had a higher incidence, as did those living in cities and the north [4].

According to Shrestha, a study was done to determine the prevalence of dyspnea among emergency department patients at our institution. The study's findings revealed that the prevalence of dyspnea among patients visiting a tertiary care hospital's emergency department was 107 (8.9%) (4.6%-13.2%) at the 95% confidence range. The patients triaged into red, orange, and yellow categories were 14 (13.1%), 50 (46.7%), and 43 (40.2%), respectively. The median age was 64 years, with 74 (69%) being above 60. Sixty-seven (62.6%) were ladies, while 40 (37.4%) were men. Forty-four (41.1%) arrived by ambulance. Cough and fever were the most commonly related symptoms, accounting for 59 (51.1%) and 44 (41.1%) cases, respectively [5].

An incentive spirometer is a device that measures the volume of the air inhaled into the lungs during inspiration. When breathing in through an incentive spirometer, a piston rises inside the device and measures the volume of the inspired air. The incentive spirometry device is widely used in physical, speech, and respiratory therapy as it encourages the patient to

perform a slow and deep inspiration through visual feedback [6].

MATERIAL AND METHODS

Study Design and Participants

Present study was a True experimental research study conducted between May 2025 to July 2025. Purposive sample of 60 dyspnea patients of selected age between 20 to 70 years and willing to participate were included in the study. Permission to conduct study was obtained from Medical Superintendent, HSK Hospital Bagalkot.

Instruments

Borg Dyspnea Scale

Dyspnea was assessed using the Borg dyspnea scale. Response options range from 0-3 Mild, 4-6 Moderate, 7-10 Severe. Scores range from 0 to 10. Scale was used in English. For the present study reliability was calculated by administering Borg dyspnea scale to 10 dyspnea patients and Karl Pearson's coefficient obtained was 0.86.

Socio-demographic Variables and Clinical Characteristics and life style factors

Socio demographic variables and clinical characteristics includes age, gender, education status, occupation, area of residence, habits, diet pattern, pulse rate, respiratory rate, sleep, spo₂, position, Do you have any chronic respiratory disease?, Do you smoke?, Duration of dyspnea?, Have you used incentive spirometry?, Have you tried ballon- blowing therapy before?

Data Collection Procedures

Prior permission was taken from relevant hospitals before the beginning of data collection procedure. The study participants were identified during study period at selected hospitals of Bagalkote. Every dyspnea patient who fulfilled the inclusion criteria was approached for data collection. Consent was obtained by the dyspnea patients. All the information collected was based on patient's self-report, but information related to dyspnea by the data collection.

Data Analysis

Data analysis was performed using SPSS v25. Descriptive statistics such as frequencies and percentages were used for socio demographic variables and clinical characteristics and life style factors. Calculation of mean, Standard Deviation of dyspnea scores. Effectiveness of balloon blowing therapy and incentive spirometry in promotion of pulmonary function in experimental group and control group was assessed using T Test. Association between the socio-demographic and clinical characteristics with Dyspnea in both experimental and control group was found using Chi Square Test.

RESULTS

Section I: Socio-demographic among dyspnea patients

Dyspnoea patients were distributed in all the age groups with highest being in control group the majority of patients belongs to 51-60 years 46.66% (14), in experimental group the majority of patients belongs to 61-70 years 40% (12). 63.33% (19) of the subjects were in the male group in experimental group, 53.33% subjects were in the female group in control group. In the experimental group majority of 36.66% (11) subjects are in PU and Graduation and no formal education, in the control group majority of subjects were in 33.33% (10) in high school and PU and graduation. Dyspnea patients were distributed according to occupation in the experimental group majority of subjects 36.66% (11) are in others, in control group 46.66% (14) in others. In the Experimental Group majority of subjects 33.33% (10) were in no any bad habits groups, in the control group majority of subjects 46.66% (14) are in the no bad habits. In experimental group the majority of subjects 66.66% (20) in the rural area, in the control group majority of subjects 60% (10) in rural area. In the experimental group majority of subjects 43.33% (13) In mixed diet, in the control group majority of subjects 53.33% (16) in vegetarian group.

SECTION-I B: Distribution of Subjects According to Their Clinical variables.

Dyspnoea patients distributed according to their Pulse rate in the experimental group majority of subjects 60% (18) are in 80-100b/m, in the control group majority of the subjects 70% (21) in category 80-100b/m. According to respiratory rate in the experimental group majority of subjects 60% (18) are in 16-20b/m, in the control group majority of other subjects 40% (12) in category 16-20b/m. According to position in the experimental group majority of subjects 53.33% (16) are in lateral position, in the control group majority of the subjects 76.66% (23) in group of Semi fowlers position. According to duration of sleep in the experimental group

majority of subjects 46.66% (14) are in 6 hours, in the control group majority of the subjects 70% (21) in group of 6 hours.

SECTION-I C: Distribution Of Subjects According to Their life style variables.

Dyspnoea patients distributed according to their Chronic Respiratory Disease in the experimental group majority of 86.66% (26) patients are having Chronic Respiratory Disease, in the control group 93.33% (28) patients are having Chronic Respiratory Disease. In the experimental group majority of 66.66% (20) patients are not having Smoking habits, in the control group majority of the 63.33% (19) patients are not having Smoking habits. In the experimental group majority of 46.66% (14) patients are having dyspnea about More than 1 year, in the control group majority of the 50% (15) patients are having dyspnea about 6 to 1 year. In the experimental group majority of 63.33% (19) patients are not using the Incentive Spirometry, in the control group majority of 96.66% (29) patients are using the Incentive Spirometry. In the experimental group all 100% (30) of the patients using the balloon blowing therapy, in the control group majority of 96.66% (29) patients not using the balloon blowing therapy.

SECTION-II: To Assess the Mean Score and Standard Deviation of Pre-Test Scores of Pulmonary Function among Dyspnea Patients in Both the Groups.

Finding revealed that the mean pretest scores of Dyspnea in experimental group pulse rate is 2.8, respiratory rate is 2.2, SPO2 is 2.6, scores 3.53, where as in control group pulse rate is 3.17, respiratory rate is 2, SPO2 is 2.8, scores 3.43.

The post test scores of Dyspnea in experimental group pulse rate is 2.2, respiratory rate is 2.13, SPO2 is 4.4, scores 1.96, where as in control group pulse rate is 2.17, respiratory rate is 2.27, SPO2 is 4.13, scores 2.6.

Table 1: Mean score & standard deviation of pre-test and post-test of experimental and control group

	Experimental Group				Control Group			
	Pre-Test		Post Test		Pre-Test		Post Test	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Pulse Rate	2.8	0.61026	2.2	0.40	3.17	0.53	2.17	0.37
Respiratory Rate	2.2	0.66	2.13	0.34	2	0.78	2.27	0.44
SPO2	2.6	0.66	4.4	0.56	2.8	0.71	4.13	0.68
Score	3.53	0.62	1.96	0.71	3.43	0.56	2.6	0.54

SECTION III: The pre-test and post-test scores according to the Borg dyspnea scale among Dyspnea patients who are admitted in HSK hospital in both the groups.

Finding reveals that in the experimental group pretest the majority of the patients 18 were having severe breathlessness (7-10), patients with Moderate breathlessness (4-6) were 10, patients with Mild

breathlessness (1- 3) were 2 and patients with no difficulty breath were 0. In the post test the majority of the patients 15 were having mild breathlessness (1-3), patients with No difficulty breath (0) were 8, patients with Moderate breathlessness (4-6) were 7 and patients with severe breathlessness 0.

Finding reveals that in the control group pretest the majority of the patients 15 were having moderate

breathlessness (4-6), patients with severe breathlessness (7-10) were 14, patients with Mild breathlessness (1-3) were 1 and patients with no difficult breath were 0. In the post test the majority of the patients 18 were having

moderate breathlessness (4-6), patients with mild breathlessness (1-3) were 11, patients with Severe breathlessness (7-10) were 1 and patients with no difficulty breath 0.

Table 2: Pre-test and Post-test scores according to the Borg dyspnea scale pain among Dyspnea patients in experimental group

Sl.No	Scores	Description	Pre test	Post test
1.	0	No difficulty breath	0	8
2.	1-3	mild breathlessness	2	15
3.	4-6	moderate breathlessness	10	7
4.	7-10	sever breathlessness	18	0

Table 3: Pre-test and Post-test scores according to the Borg dyspnea scale pain among Dyspnea patients in Control group

Sl.No	Description	Scores	Pre- test	Post test
1.	No difficulty breath	0	0	0
2.	Mild breathlessness	1-3	1	11
3.	Moderate breathlessness	4-6	15	18
4.	Sever breathlessness	7-10	14	1

SECTION IV: To assess the effectiveness of balloon blowing therapy and incentive spirometry in promotion of pulmonary function in experimental group and control group.

Findings reveals that the comparison of pre-test and post-test scores in the experimental group was calculated with 'paired t test'. The calculated t value is 15.09 and the table value is 2.05 with the significance level of 0.05. The calculated value is more than the table value. Hence it is significant and effective and accepted

the H1. Mean post-test grades of dyspnea patients will be significantly higher than mean pretest scores of Balloon Blowing Exercise in experimental group.

Findings reveals that the comparison of pre-test and post-test scores in the control group was calculated with 'paired t test'. The calculated t value is 4.29713 and the table value is 2.05 with the significance level of 0.0004. The calculated value is more than the table value. Hence it is significant and effective and accepted the H1.

Table 4: Showing the significance level of mean post-test scores than the mean pre-test score in experimental group

Experimental group	Total sample	Mean	Standard Deviation	T value	T table value	Significance
Pre-test	30	3.54	0.62	15.09	2.05	Significant

Table 5: showing the significance level of mean post-test scores than the mean pre-test score in control group

Control group	Total sample	Mean	Standard Deviation	T value	T table value	Significance
Pre-test	30	3.43	0.56	4.29713	2.05	Significant
Post-test		2.6	0.54			

SECTION V: To find out the association between the pre-test score of Dyspnea and Socio Demographic variables in both the groups.

Findings reveal that in the experimental group the demographic variables (Gender, Education, Occupation, Area of residence, Pulse Rate, Position, Usage of incentive spirometry, Usage of balloon blowing Any other treatment has taken for Dyspnea?) did not show statistically significant association with pretest level of Borg Dyspnea Scale among Dyspnea patients at $p < 0.05$.

Findings reveal that that in the control group the demographic variables (Age, Gender, Education, Occupation, Area of residence, Diet, Respiratory Rate, Position, Sleep, Do you have Chronic respiratory disease, Duration of dyspnea, Usage of incentive spirometry, Usage of balloon blowing. Any other treatment has taken Dyspnea?) did not show statistically significant association with pre test level of level of Borg Dyspnea Scale among Dyspnea patients at $p < 0.05$.

Table 6: Association among the sociodemographic variables in experimental group.

Sl.No	Sociodemographic variables	Degree of freedom	X2	Table	Significance
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				value	
1	Age	12	5.2429	21.03	Significant
2	Gender	3	0.3827	7.82	Not significant
3	Education	9	2.5818	16.92	Not significant
4	Occupation	9	3.3701	16.92	Not significant
5	Habits	9	4.474	16.92	Significant
6	Area of residential	3	2.5	7.82	Not significant
7	Diet	6	5.9362	12.59	Significant
8	Pulse rate	9	2.5556	16.92	Not significant
9	Respiratory rate	9	5.0926	16.92	Significant
10	Position	9	3.5666	16.92	Not significant
11	Sleep	9	5.53	16.92	Significant
12	Do You Have Chronic Respiratory Disease	3	16.153338	7.82	Significant
13	Do you smoke	6	4.4001	12.59	Significant
14	Duration of dyspnea	6	9.2466	12.59	Significant
15	Usage of incentive Spirometry	3	3.7321	7.82	Not significant
16	Usage of balloon blowing	3	0	7.82	Not significant

Table 6.10: Association among the sociodemographic variables in Control group

Sl.No	Socio demographic variables	Degree of freedom	X2	Table value	Significance
1	Age	12	2.778	21.03	Not significant
2	Gender	3	1.2241	7.82	Not significant
3	Education	9	3.0503	16.92	Not significant
4	Occupation	9	2.8912	16.92	Not significant
5	Habits	9	7.6142	16.92	Significant
6	Area of residential	3	1.8254	7.82	Not significant
7	Diet	6	1.2244	12.59	Not Significant
8	Pulse rate	9	15.1259	16.92	Significant
9	Respiratory rate	9	2.4921	16.92	Not significant
10	Position	9	2.737	16.92	Not significant
11	Sleep	9	2.7628	16.92	Not significant
12	Do You Have Chronic Respiratory Disease	3	2.1429	7.82	Not significant
13	Do you smoke	6	6.0902	12.59	Significant
14	Duration of dyspnea	6	1.6881	12.59	Not significant
15	Usage of incentive Spirometry	3	1.1821	7.82	Not significant
16	Usage of balloon blowing	3	1.0344	7.82	Not significant

DISCUSSION

The main objective of the present study was to determine the effectiveness of BBT and IS in the promotion of pulmonary function. This True-experimental study was included a sample of 60 dyspnea patients in Selected Hospitals at Bagalkot. The present study depicts the frequency distribution of dyspnea patients in experimental age group, the majority of patients belongs to 61-70 years 40% (12), in control group the majority of patients belongs to 51-60 years 46.66% (14).

Similar study was conducted by Pramote Saetan it depicts that the percentage wise distribution of samples according to their age shows that of dyspnea patients 42.9% of experimental age group 61-70 yrs. 64.3% of control group of dyspnea patients more than 70 [7].

The present study depicts that the experimental group majority 63.33% (19) of the subjects were in the

male group, in the control group majority of the subjects 53.33% were in the female group.

Similar study was conducted by Lai *et al.* reported a quasi-experimental design in which the only significant baseline difference between groups was gender ($p = 0.018$), with the control group having higher male representation than the experimental group. This parallels our study, where 63.33% of males were in the experimental group versus a majority of females (53.33%) in the control group. Such differences underscore the importance of considering gender as a potential confounder and discussing it as a limitation [8].

The present study shows that in the experimental group majority of subjects 60% (18) are in 18-100b/m, 30% (9) in 60-80b/m category, in the control group majority of the subjects 70% (21) in category 80-100b/m.

Similar study was conducted by Sobieraj *et al.* observed that baseline RHR clustered between 60–100 bpm with ~1.4% ≥ 100 bpm, reinforcing that tachycardia (>100 bpm) was uncommon at baseline [9].

The present study shows that the experimental group majority of 86.66% (26) patients having chronic respiratory disease, in the control group majority of 93.33% (28) patients having chronic respiratory disease.

Similar study was conducted by Solomon Asch, it depicts that the control group, participants faced no social pressure and made errors on less than 0.7% of critical trials. The experimental (pressure) condition, 64.3% of responses were correct (i.e., majority “Yes”-like), while 35.7% conformed incorrectly (i.e., “No”-like) a substantial minority but importantly, participants’ behavior still showed a distinct majority response [10].

Limitations of the Study

Although present study patients with dyspnea age between 20 to 70 years. Patients with dyspnea who had diagnosis of respiratory disease confirmed by registered physician. Those who are able to provide essential information on questionnaires.

CONCLUSIONS

Balloon Blowing Therapy was found to be significantly more effective than Incentive Spirometry in promoting pulmonary function and reducing dyspnea symptoms. It is a simple, low-cost, and non-invasive intervention that can be incorporated into respiratory care for dyspnea patients.

Ethical Clearance

Ethical clearance was obtained from the institutional ethical committee of BVVS Sajjalashree Institute of Nursing Sciences, Bagalkot.

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Conflict of Interest: Nil

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