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A Study to Assess the Effectiveness of Hypertonic Saline Nebulization on Airway Clearance among TB Chest Ward Patient in Government Doon Medical College Hospital Dehradun Uttarakhand

Deepti[1], Mayank Kumar Jaimini[2]

[1]Department of Medical Surgical Nursing State College of Nursing Dehradun, Uttarakhand, India
Email: *deepti.aswal.95[at]gmail.com*

[2]Assistant Professor, Department of Medical Surgical Nursing State College of Nursing Dehradun, Uttarakhand

Abstract: ***Background: Tuberculosis (TB) is an ancient disease that continues to pose a significant global health challenge, particularly in developing countries. Despite the availability of effective treatment regimens, TB remains a leading cause of morbidity and mortality worldwide, with approximately 10 million new cases and 1.4 million deaths reported annually. One of the major complications of TB is the accumulation of excessive mucus in the airways, which can lead to impaired airway clearance and increased risk of respiratory infections. Objective: To evaluate the effectiveness of hypertonic saline nebulized on airway clearance in the experimental and control group. Materials and Methods: Quantitative Approach with quasi - experimental non - equivalent control group pre - test and post - test Research design was used in the study. A convenient sampling technique was used to collect data from 60 tuberculosis patients, based on the inclusive criteria 30 samples in experimental group and 30 samples in control group was selected. The study was conducted in Government Doon Medical College Hospital Dehradun Uttarakhand. On the first day data on the demographic variables of the control group were collected using a structured interview method. A pretest was then conducted on the participants using the self - structed observational check list to assess level of airway clearance. Patients nebulized with routine medicine (duoline twice a day) for the control group and hypertonic saline (once a day with routine medicine same as control group) for the experimental group was done every day for 10 minutes. Three days after the nebulization, at 8 a. m. (between 8 and 10.30 a. m.), a post - test was performed using the same observational check list. Result: Data analysis showed that the mean post - test level of airway clearance in experimental group 1.53 (SD+ 0.66) was significantly lower than the mean post - test level of airway clearance scores in control group 1.80 (SD + 0.55) and mean difference is 0.27. The parried 't' value of experimental group was 10.77 which was significant at <0.05 level. Conclusion: Hypertonic saline nebulization is effective in maintaining airway clearance that denoted by significant difference between the pre and post intervention score of airway clearance among tuberculosis patient at TB chest ward in experimental group. Subjects found themselves comfortable and also expressed their satisfaction.***

Keywords: Assess, Hypertonic Saline, Nebulization, Airway Clearance, Tuberculosis

1. Introduction

The Global Burden of Disease data suggest that respiratory diseases contribute to high morbidity in India. However, the factors responsible for high morbidity are not quite clear. Therefore, the Seasonal Waves of Respiratory Disorders (SWORD) study was planned to estimate the point prevalence due to respiratory diseases in Indian OPD services and its association with risk factors and change in seasons. The common diagnoses were: asthma (29.8%), chronic obstructive pulmonary disease (COPD), 15.6%, respiratory tract infections (RTIs), 11.3%, and tuberculosis (8.7%)

Tuberculosis (TB) is a bacterial infection caused by the bacillus Mycobacterium tuberculosis. It is an aerobic, rod - shaped, Acid Resistant Bacteria. Which is highly contagious due to the droplet mode of transmission. This bacterium most often affects the lungs, meninges, kidneys, and bones, other organs. The entry of tuberculosis germs into the respiratory system through the nose and pharynx and it travels to the alveoli, release pathogens into the lower respiratory tract, lead to a productive cough.

National tuberculosis institute More than 40% of the population in India carries a tuberculosis infection in their body, but only 10% get TB disease. The global incidence of tuberculosis is 127/ lakh and death are 17/ lakh. In India, the incidence of tuberculosis is 188/ lakh and death are 36/ lakh.

As per the **National TB Report released in March (2022,)** 23, 574 tuberculosis patients were officially reported in Uttarakhand., the estimated total TB Cases are 237/Lac per year in 2022 including both public and private sector were in Dehradun (139 cases), followed by Haridwar (101 cases).43 TB cases are reported every day in Uttarakhand. Dehradun district has notified 3473 TB patients, of whom 2876 are currently undergoing treatment. In 2021, there were 7, 000 reported cases in the district.

TB patients often find it challenging to adhere to treatment regimens, including airway clearance techniques. Airway clearance is crucial for TB patients, as the disease often leads to the accumulation of thick, tenacious secretions in the airways, impairing respiratory function and hampering recovery. The effectiveness of airway clearance techniques is critical in reducing the morbidity and mortality associated with TB, which necessitates a deeper understanding and potential improvements in existing treatment protocols. Understanding the effectiveness and benefits of hypertonic saline nebulization can potentially lead to a more comfortable

and acceptable treatment option for patients. There is a notable gap in the literature regarding the use of hypertonic saline nebulization as a therapy for airway clearance in TB patients. While it has shown promise in other respiratory conditions, its specific application and effectiveness in TB patients require investigation.

2. Material and Methods

Quantitative Approach with quasi - experimental non - equivalent control group pre - test and post - test Research design was used in the study. A convenient sampling technique was used to collect data from 60 tuberculosis patients, based on the inclusive criteria 30 samples in experimental group and 30 samples in control group was selected. The study was conducted in Government Doon Medical College Hospital Dehradun Uttarakhand. On the first day data on the demographic variables of the control group were collected using a structured interview method. A pretest was then conducted on the participants using the self - structed observational check list to assess level of airway clearance. Patients nebulized with routine medicine (duoline twice a day) for the control group and hypertonic saline (once a day with routine medicine same as control group) for the experimental group was done every day for 10 minutes. Three days after the nebulization, at 8 a. m. (between 8 and 10.30 a. m.), a post - test was performed using the same observational check list. Data analysis was done by using SPSS version 25. I used both descriptive (mean, percentage. standard deviation) and inferential statistics.

3. Instrument/ Tool

It consists of three sections:

Section A - A structured interview schedule, which is prepared by the researcher and validated by five experts. It consists of four items of sociodemographic variables: age, sex, occupation, and history of smoking.

Section B - Clinical variables consist of seven items: fever, loss of appetite, loss of weight, shortness of breath, cough, type of mucus secretion, and type of ventilation.

Section C - A self - structured observational check list for airway clearance consists of 7 items: Heart rate per minute, Respiratory rate per minute, Spo2, Restlessness: non – purposeful movements. Wheezing, Sputum, Dyspnoea The overall score is 15, it is classified as well cleared airway (0 - 5), moderately cleared airway (6 - 10), mild cleared airway (11 - 15).

Statistical Analysis

Frequency and percentage distribution were used to analyses the demographic variables and the mean and standard deviation were calculated. Independent t' test can be done for comparison of pre - test and post - test values in experimental and control group.

Table 1: Frequency and percentage distribution of subjects by pre - test and post - test level of airway clearance among Tb chest ward patients in both the control group and the experimental group, N (30)

S No.	Level of airway clearance	Control group				Experimental group			
		Pre test		Post test		Pre test		Post test	
		F	%	f	%	F	%	F	%
1.	Well cleared	3	10	10	33.3	1	3.3	16	53.3
2.	Moderate cleared	16	53.3	16	53.3	18	60	12	40
3.	Mild cleared	11	36.7	4	13.3	11	36.7	2	6.7

Table 2: Comparison between pretest and post - test airway clearance scores among TB chest ward patients in the control group and experimental group, N=30

S. no	Airway clearance	Pretest Mean± SD	Post - test Mean± SD	DF	t - test	P value
1	Control	2.27±0.64	1.80±0.664	29	5.037	<0.001
2	Experimental	2.330±0.55	1.53±0.629	29	10.77	<0.001

Significant at level of $p<0.05$

There was a lower mean score in the post - test airway clearance level than in the pretest airway clearance level. After intervention, airway clearance levels are decreasing in both groups, but the mean score of the post - test airway clearance in the experimental group is lower than the control group mean score

4. Discussion

The Mean±SD score of level of airway clearance in experimental group was2.330±0.55 in pretest and 1.53±0.629 in post - test, calculated 't' value was 10.77 which was higher than tabulated value of 't' 2.045 at 0.05 level of significant. The result was supported by the finding of the study conducted by **Ang S, Sumardi, Erna Kristin** "compare the effectiveness of ambroxol and use a hypertonic saline induction on new suspected pulmonary tuberculosis patients to increase sputum volume and to find AFB" The Mean±SD Initial sputum volume nebulizer induction group was1.763±0.1796 and 5.171±0.588 in post - test, there were significant differences indicated by p - values<0.001 with the hypertonic saline nebulizer induction group having more sputum volume after treatment. The Mean±SD Initial sputum volume (S1) in ambroxol group was 1.316±0.1257 and 1.763±0.1796 in nebulizer induction group, Initial sputum volume (S1) did not show a significant difference between the ambroxol and hypertonic saline nebulizer induction groups.

Ethical Consideration

Administrative permission was obtained from the principal and ethical committee of the State College of Nursing, 107, Chander Nagar, Dehradun, Uttarakhand. To conduct the

research study, Written permission was obtained from Dr. **Y. Rizvi (CMO)** of Government Doon Medical College, Dehradun, for. Written informed consent was obtained from the participant's parents for the study

Conflicts of Interest: Non declared

Financial Support: NIL

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