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PHYSICAL THERAPY MANAGEMENT IN SWINE-INFLUENZA A (INDIAN H1N1) VIRUS –A CASE STUDY

Physiotherapy

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ABSTRACT

Background:- H1N1 is also known as "swine flu" and it is a novel strain of Influenza A virus that evolved by genetic reassortment. It leads to annual epidemics of varying severity. It causes severe illness requiring hospitalization, including severe pneumonia, hypoxemia, lung injury with acute respiratory distress and complications involving renal, liver and cardiac dysfunction. Fever and cough are most common presenting symptoms. Mortality rate is high in H1N1-infected patients with development of ARDS, and patients who require ventilatory support.

Case Report: - We report a case of a young male patient suffering from H1N1 is also known as "swine flu". The patient had a severe infiltration in lungs and was mechanically ventilated on admission. Progressive chest and limb physiotherapy was given to the patient. Physical therapy intervention improved respiratory statuts of the patient as well as aided speedy recovery from this chronic ailment

KEYWORDS

Introduction

Influenza is a common human virus which can lead to varying degree of respiratory infections ranging from mild flu to severe and life-threatening pneumonia, bronchitis, acute respiratory distress syndrome, and even death. H1N1 is also known as "swine flu" and it is a novel strain of Influenza A virus that evolved by genetic reassortment. It leads to annual epidemics of varying severity. Pandemic of H1N1 first emerged in 2009 April, which was started in Mexico and soon expanded globally. In India, the first case was identified on 2009 May 16, in Hyderabad.[1]

The symptoms on presentation are cough, throat pain, common cold, fever, breathlessness, headache, chest pain, sputum production, vomiting, and hemoptysis in majority of cases. Increased respiratory rate (tachypnea), low oxygen saturation (hypoxia), WBC count within normal range, and lower level of procalcitonin in blood are also commonly found. [1]. Commonest radiological presentation on x-ray chest is pulmonary infiltration followed by consolidation.[1]

H1N1 influenza causes severe illness requiring hospitalization, including severe pneumonia, hypoxemia, lung injury with acute respiratory distress and complications involving renal, liver and cardiac dysfunction. Maximum patients are between age group of 20-40 year. Fever and cough are most common presenting symptoms. Common comorbidities are pregnancy, diabetes, hypertension, and obesity. Mortality rate is high in H1N1-infected patients with development of ARDS, associated pregnancy and patients who require ventilatory support.[1-2]

The severe illness and deaths associated with seasonal influenza/ swine influenza infection epidemics are in large part the result of secondary complications, including primary viral pneumonia, secondary bacterial pneumonia (particularly with group A Streptococcus, Staphylococcus aureus, and Strep. pneumoniae) and exacerbations of underlying chronic conditions.[3,4-5]

A diagnosis of confirmed swine flu requires laboratory testing of a respiratory sample (a simple nose and throat swab).[3]

There are very limited number of studies on influenza virus-related diseases and morbidity in India[1].

Present study is an effort to reveal the predictors of mortality for better preparation to handle any such epidemics in future.

There is dearth of literature regarding physical therapy evaluation and management of patients suffering from Swine-Influenza A (Indian H1N1) virus. We present our experience with physical therapy management of a patient suffering with Swine-Influenza A (Indian H1N1) virus with an aim to improve his respiratory status, remove retained secretions and help the patient to recover from illness through physical therapy regime.

Patient Information and Clinical findings:-

The patient chosen for study was a 35 year old male patient, recruited from the Casualty ICU and Day Care Unit of Pt.B.D.S., U.H.S., Rohtak. Patient was clinically diagnosed with Swine-Influenza A (Indian H1N1) virus. Detailed history and physical examination, including the onset and nature of symptoms, general and systemic manifestations was recorded for the patient.

The patient was evaluated thoroughly using an evaluation performa. Primary symptoms of the patient included fever, shortness of breath, cough with expectoration, chest crepitation with atelectasis in both lungs (left lung more than right).

Therapeutic Intervention:-

The patient was given physiotherapeutic treatment including chest and limb physiotherapy. Measurements were taken at two time intervals, one at the time of admission of patient (PRE) and second after ten days of admission (POST). Effects of physiotherapy treatment were studied on dependent variables including static lung compliance (C_{ST}), oxygenation ratio (PaO2:FiO2 ratio), partial pressure of carbon dioxide in arterial blood ($PaCO_2$) , cologarithm of activity of dissolved hydrogen ions in arterial blood (pH) and chest X-rays.

Protocol

The patient was given physical therapy exercise management, which included the following exercise protocols:-

1. Position of Patient- Patient had primarily involvement of left lung

and hereby was positioned accordingly; then postural drainage was being done first for left lung and then for the right lung.

2. Chest Physiotherapy:-Patients was given Breathing exercises, also bronchial hygiene therapy and cough training for clearance of chest secretions.
3. Limbs Exercise:- Limb movements were done including both active and passive range of motion exercises for maintaining joint mobility.
4. Patient bed positioning: - Position of the patients was changed every 2-3 hourly to prevent bed sores and maintain mobility.

Patient's Daily Treatment and Changes in Intervention:-

Initially at the time of admission, the patient was on Pressure control mode with a PEEP level of 8 cmH_2O. He was being given chest physiotherapy in form of breathing exercises, secretion clearance through postural drainage, percussion and segmental vibration techniques along with suction for secretion clearance. After seven days of admission, patient was weaned off to pressure support mode and on 9^{th} day of admission patient was on PEEP level of 6 cmH_2O. On the 10^{th} day of admission patient was extubated and taken on T-piece. Further, non invasive ventilation was given by Hudson mask. The physical therapy regime was progressed to cough training and chest wall mobilization exercises. On further progression to O_2support with nasal prongs and oral diet being allowed to semi solid, the patient was made to walk around the ward with support. The Chest physiotherapy regime was progressed in frequency and repetition including the above mentioned therapeutic interventions and rigorous cough training was given to the patient. Finally, patient was discharged twenty days post admission with normal spontaneous breathing at its own.

Frequency and Repetitions: -

Chest and limb physiotherapy was done twice a day.

Follow-up and Outcomes

Post intervention measures of the variables were recorded at the time of admission and after 15 days of admission. Static lung compliance (CST) readings were recorded from the display on the ventilator. An average of three readings of static pulmonary compliance was taken.Arterial blood gas analysis samples were taken to monitor oxygenation(PaO2:FiO2),partial pressure of carbon dioxide in arterial blood (PaCO2) and cologarithm of activity of dissolved hydrogen ions in arterial blood (pH) (Table 1).

Table 1:- Comparison of before and after intervention

Variables	Time		% improvement
	Pre (before intervention)	Post (after intervention)	
pH	7.38	7.35	-0.41%
PaO_2:FiO_2 Ratio	356.6667	462.6667	29.72%
Cstat (mL/cmH2O)	39.4	47.1	19.54%
$PaCO_2$ (mm Hg)	54.6	33.6	-38.4%

There was 29.72% improvement in the PaO_2:FiO_2 Ratio, 19.54% improvement in the Cstat (mL/cmH2O) values, a reduction by -0.41% in pH values, and a reduction by -38.4% in the $PaCO_2$ (mm Hg) values. All the parameters showed clinical improvement.

Chest X-rays showed marked changes from baseline (Fig.1a and Fig.1b).

Fig.1 (A):- on the day of admission

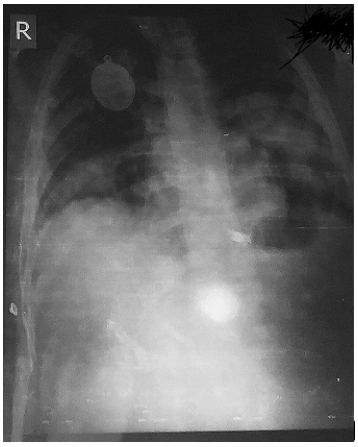

Fig.1 (B):- Two weeks post admission

Discussion

H1N1 influenza causes severe illness requiring hospitalization, including severe pneumonia, hypoxemia, lung injury with acute respiratory distress and complications involving renal, liver and cardiac dysfunction.[1-2]

Respiratory failure being major reason for mortality, careful monitoring, and appropriate management and early recognition of this complication may decrease the mortality rate among these patients. Physical therapy may be indicated for patients in intensive care setting when they have retained secretions and radiological evidence of atelectasis or infiltrate. In addition, mechanically ventilated patients are at risk for retained secretions due to endotracheal intubation disrupting mucociliary escalator, relative immobility of mechanically patient confined to bed can lead to atelectasis, impaired cough, and retained secretions., Physical therapy interventions in patients admitted in ICU's include postural drainage, breathing exercises, percussion, vibration, manual hyperinflation, coughing, huffing, and suction.[4-5]

C_{ST} is considered as important clinical outcome measure, and may be used to predict mortality in patients with respiratory failure. In present study, there was improvement in static lung compliance, after intervention. The application of chest physiotherapy techniques may have facilitated collateral ventilation and effective recruitment of alveoli, thereby improving time-dependent elastic behavior of the lung [6-7].

In addition, PaO2:FiO2 ratio mean values showed percentage improvement and also there was reduction in PaCO2 and pH values post admission. The probable reason is that with increase in the recruitment of functional alveolar units after intervention, there may have been an improvement in ventilation- perfusion ratio; decreased shunting of blood in lungs and improved oxygen transport in blood.[8]

Conclusion

The present study concludes that the physical therapy exercise programme is effective in patients suffering from Swine-Influenza A (Indian H1N1) virus. Physical therapy intervention not only improves respiratory status in patients suffering with Swine-Influenza A (Indian H1N1) virus but also aids in speedy recovery from this chronic ailment.

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