EFFECT OF CORTICOSTEROIDS ONSERUMPOTASSIUM LEVELS IN PATIENTS WITH OBSTRUCTIVE AIRWAY DISEASES

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***Abstract*: Corticosteroids, also called glucocorticoids or steroids, are hormones produced by the adrenal cortex, part of the adrenal glands. These hormones affect almost all body organs and are extremely important in maintaining homeostasis when secreted in normal amounts to have different functions. The goals of corticosteroids during treatment are to decrease exacerbation of symptoms and improve quality of life in patients with obstructive airway diseases. Thus corticosteroids play an important role in the therapy of obstructive airway diseases. Hypokalemia is one of the major adverse effects of corticosteroids. Serum potassium is the most specific indicator available for the diagnosis of hypokalemia. This review is designed to investigate the effects of corticosteroids on serum potassium levels in patients with obstructive airway disorders along with the route which caused more effects and the drug which caused more prominent effects**

***Keywords*: Obstructive airway disorders, Potassium, Corticosteroids, Hypokalemia.**

INTRODUCTION

Obstructive airway diseases are a category of respiratory disease characterized by airway obstruction.Many obstructive diseases of the lung result from narrowing of small bronchi and larger bronchioles,often because of excessive contraction of smooth muscle itself .It is generally characterized by inflamed and easily collapsible airways, obstruction to airflow problems exhaling and frequent medical clinic visits and hospitalizations.Types of obstructive lung diseases include bronchiectasis, asthma, bronchitis and chronic obstructive pulmonary diseases,cystic fibrosis.

Bronchiectiasis[1]

Bronchiectasis is a long-term condition where the airways of the lungs become abnormally widened, leading to a build-up of excess mucus that can make the lungs more vulnerable to infection.The most common symptoms of bronchiectasis include: a persistent cough that usually brings up phlegm and breathlessness. The lungs are full of tiny branching airways, known as bronchi. Oxygen travels through these airways, ends up in tiny sacs called alveoli, and from there is absorbed into the bloodstream.The inside walls of the bronchi are coated with sticky mucus, which protects against damage from particles moving down into the lungs. In bronchiectasis, one or more of the bronchi are abnormally widened. As a result, more mucus than usual gathers there, which makes the bronchi more vulnerable to infection. If an infection does develop, the bronchi may be damaged again, so even more mucus gathers in them, and the risk of infection increases further. Over time, this cycle can cause gradually worsening damage to the lungs.

Asthma[2]

The National Asthma Education and Prevention Program (NAEPP)defines asthma as a chronic inflammatory disorder of the airways in which many cells and cellular elements play a role. In susceptible individuals,inflammation causes recurrent episodes of wheezing, breathlessness, chest tightness, and coughing. These episodes are usually associated with airflow obstruction that is often reversible either spontaneously or with treatment.The inflammation also causes an increase in bronchial hyperresponsiveness to a variety of stimuli.

Chronic Obstructive Pulmonary Diseases[3]

COPD is a disease state characterised by airflow limitation that is not fully reversible. The airflow limitation is usually both progressive and associated with an abnormal inflammatory response of the lungs to noxious particles or gases.The most common are emphysema and chronic bronchitis. Many people with COPD have both of these conditions.Emphysema slowly destroys air sacs in your lungs, which interferes with outward air flow. Bronchitis causes inflammation and narrowing of the bronchial tubes, which allows mucus to build up.

Long-term exposure to lung irritants that damage the lungs and the airways usually is the cause of COPD. In the United States, the most common irritant that causesCOPD is cigarette smoke. Pipe, cigar, and other types of tobacco smoke also can cause COPD, especially if the smoke is inhaled.

- Emphysema**:** This lung disease causes destruction of the fragile walls and elastic fibers of the alveoli. Small airways collapse when you exhale, impairing airflow out of your lungs.
- Chronic bronchitis**:** In this condition, your bronchial tubes become inflamed and narrowed and your lungs produce more mucus, which can further block the narrowed tubes. You develop a chronic cough trying to clear your airway.

Cystic fibrosis[4]

Cystic fibrosis is an inherited disorder that causes severe damage to the lungs, digestive system and other organs in the body.Cystic fibrosis affects the cells that produce mucus, sweat and digestive juices. These secreted fluids are normally thin and slippery. But in people with cystic fibrosis, a defective gene causes the secretions to become sticky and thick. Instead of acting as a lubricant, the secretions plug up tubes, ducts and passageways, especially in the lungs and pancreas.

People with cystic fibrosis have a higher than normal level of salt in their sweat. Parents often can taste the salt when they kiss their children. Most of the other signs and symptoms of cystic fibrosis affect the respiratory system and digestive system. However, adults diagnosed with cystic fibrosis are more likely to have atypical symptoms, such as recurring bouts of inflamed pancreas (pancreatitis), infertility and recurring pneumonia.The thick and sticky mucus associated with cystic fibrosis clogs the tubes that carry air in and out of your lungs. This can cause signs and symptoms such as persistent cough that produces thick mucus (sputum), wheezing, breathlessness.

Corticosteroids[5]

Cortocosteroids find their effectiveness in all the above mentioned diseases.Corticosteroids, also called glucocorticoids or steroids,are hormones produced by the adrenal cortex, part of the adrenal glands. These hormones affect almost all body organs and are extremely important in maintaining homeostasis when secreted in normal amounts. Disease results from inadequate or excessive secretion. Exogenous corticosteroids are used as drugs in a variety of disorders. Their use must be closely monitored,because they have profound therapeutic and adverse effects. The term corticosteroids actually refers to all secretions of the adrenal cortex, but it is most often used to designate the glucocorticoids, which are important in metabolic, inflammatory, and immune processes. Glucocorticoids include cortisol, corticosterone, and cortisone. Cortisol accounts for at least 95%of glucocorticoid activity, and approximately 15 to 20 milligrams of glucocorticoids are secreted daily. Corticosterone accounts for a small amount of activity, and approximately 1.5to 4 milligrams of corticosterone are secreted daily. Cortisone accounts for little activity and is secreted in minute quantities. Glucocorticoids are secreted cyclically, with the largest amount being produced in the early morning and the smallest amount during the evening hours (in people with a normal day–night schedule). At the cellular level, glucocorticoids account for most of the characteristics and physiologic effects of the corticosteroids. Mineralocorticoids play a vital role in the maintenance of fluid and electrolyte balance. Aldosterone is the main mineralocorticoid and is responsible for approximately 90% of mineralocorticoid activity.

Hypokalemia[6]

Low serum potassium concentration is the most common electrolyte abnormality encountered in clinical practice. When defined as a value of less than 3.6 mmol of potassium per liter, hypokalemia is found in over 20 percent of hospitalized patients. The majority of these patients have serum potassium concentrations between3.0 and 3.5 mmol per liter, but as many as one quarter have values below 3.0 mmol per liter. Hypokalemia is usually well tolerated in otherwise healthy people, but it can be life threatening when severe. Even mild or moderate hypokalemia increases the risks of morbidity and mortality in patients with cardiovascular disease. As a result, when hypokalemia is identified, the underlying cause should be sought and the disorder treated.Potassium is a very important mineral for the proper function of all cells, tissues, and organs in the human body.It is also an electrolyte, a substance that conducts electricity in the body. Potassium is crucial to heart function and plays a key role in skeletal and smooth muscle contraction.Hypokalemia and muscle weakness can be seen after administration of corticosteroids. Hypokalemia is defined as serum potassium level less than 3.5 mEq/L (3.5 mmol/L). Severe hypokalemia is a level of less than 2.5 mEq/L .If potassium levels in blood is low;weakness, fatigue, lassitude,palpitation, constipation,cardiac arrhythmias occurs .Psychological symptoms (eg, psychosis, delirium, hallucinations, depression) also occurs.Severehypokalemia may manifest as bradycardia with cardiovascular collapse. Potassium depletion and hypokalemia increase both systolic and diastolic blood pressure when sodium intake is not restricted, presumably by promoting renal sodium retention.Hypokalemia can result from an acute shift of potassium from the extracellular compartment to cells, from inadequate intake, or from abnormal losses. Most commonly,hypokalemia is the result of either abnormal loss through the kidney or loss in the stool induced by diarrhea.

METHODOLOGY

OBJECTIVES

- To investigate the effect of corticosteroids(NEB.BUDESONIDE 0.5 mg and INJ.HYDROCORTISONE 100mg) on serum potassium levels in patients with obstructive airway disorders.
- To determine medication adherence in pulmonary obstructive patients and to assess the quality of life.

INCLUSION CRITERIA

- Patients having obstructive airway disease prescribed with neb.budesonide and inj hydrocortisone individually, admitted in the inpatient department, Department of Pulmonary medicine, Pushpagiri Medical College Hospital, Thiruvalla.
- Those who give consent voluntarily to participate in the study.
- Both female and male.

EXCLUSION CRITERIA

- Patients who are not willing to give the consent.
- Patients taking potassium supplements.

- Diseases that cause Hyperkalemia(Type1 DM, kidneyfailure,addisonsdisease) or Hypokalemia (diarrhoea,leukemia,cushings disease)
- Patients taking drugs causing Hyperkalemia(ACEinhibitors,ARB's)or Hypokalemia(beta2agonists,laxatives,aminoglycosides).

STUDY POPULATION

60 patients

STUDY PERIOD

6 months.

SAMPLE SIZE AND POPULATION

$2\,ni = 60 \qquad ni = 2\,(Z\sigma / E)2$

σ = Standard deviation

E = Margin of error

Z = value for normal standard distribution reflecting the confidence interval.

BRIEF PROCEDURE OF THE STUDY:

A prospective experimental study was conducted in Department of Pulmonary medicine in Pushpagiri Medical College Hospital after getting approval from Institutional Ethics Committee. All patients were given a brief introduction regarding the study and the confidentiality of data. A written informed consent will be obtained from the patient or care giver. Patients diagnosed with obstructive airway disorders such as asthma, bronchiectasis, bronchitis and chronic obstructive pulmonary diseases,cystic fibrosis will be identified and their hospital record in the department will be studied. After obtaining their IP number, name and other demographic details, from the Biochemistry lab residual blood was obtained. Residual blood is the blood remaining after the blood routine analysis in the lab. Blood was not withdrawn directly from the patient and any financial burden was not imposed on the patient. The collected residual blood from the lab was analysed for potassium using semi auto analyser in the Pushpagiri College of Pharmacy. Medication adherence of the patients were found out using Morisky medication adherence scale. Quality of life was assessed by using Quality of Life Enjoyment and Satisfaction Questionnaire –Short Form (Q-LES-Q-SF).

Procedure to find out potassium

• Blank: pipette out 1ml potassium reagent and 20µl distilled water to a test tube.

• Standard: pipette out 1ml potassium reagent and add 20µl Potassium standard to a test tube.

• Test: pipette out 1ml Potassium reagent and add 20µl patient's serum sample to a test tube.

•mix well and Incubate for 5 minutes at room temperature.

• Read the potassium using semi auto analyser.

Reference interval ; serum potassium: 3.5 to 4.5 mmol/L.

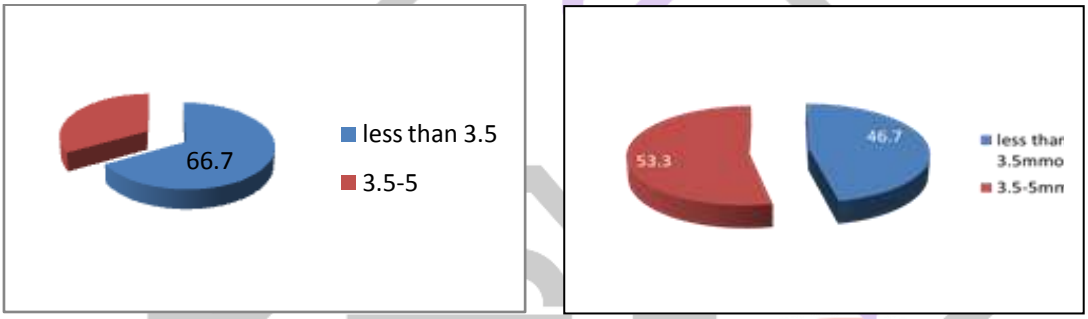
PLAN OF ANALYSIS

Analysis of data was done using SPSS version 20 statistical software and the statistical method which was used to compare potassium levels between the two drugs was Pearson's correlation analysis. Significance was determined by P-value. P value less than 0.05 was considered as significant.

RESULTS AND DISCUSSION

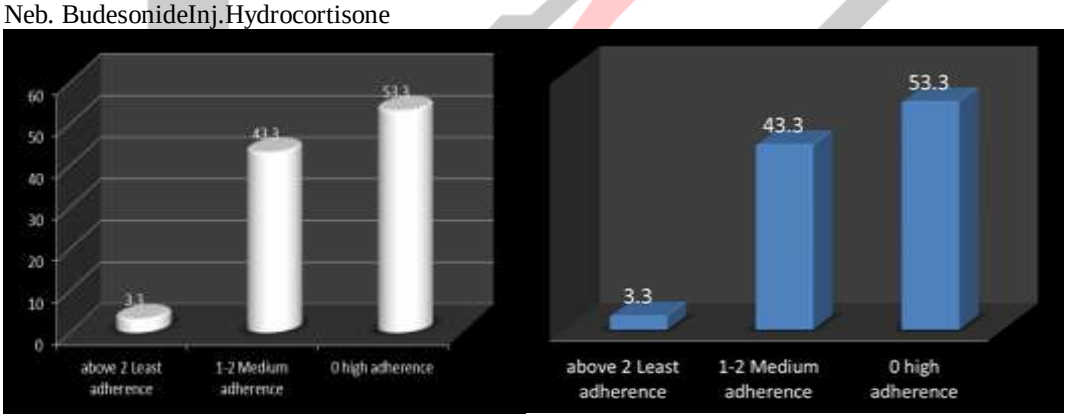
- DISTRIBUTION OF PATIENTS BASED ON HYPOKALEMIA(%)

  Neb.BudesonideInj.Hydrocortisone



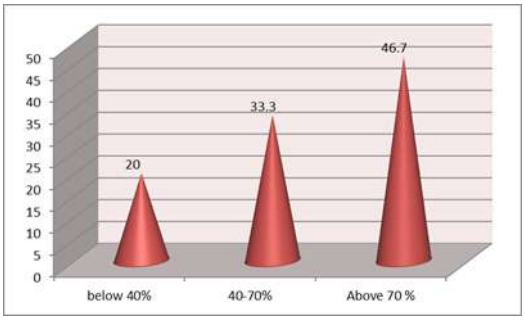
- DISTRIBUTION OF PATIENTS BASED ON MEDICATION ADHERENCE

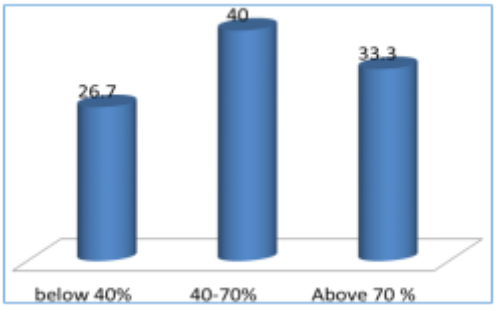
  Neb. BudesonideInj.Hydrocortisone



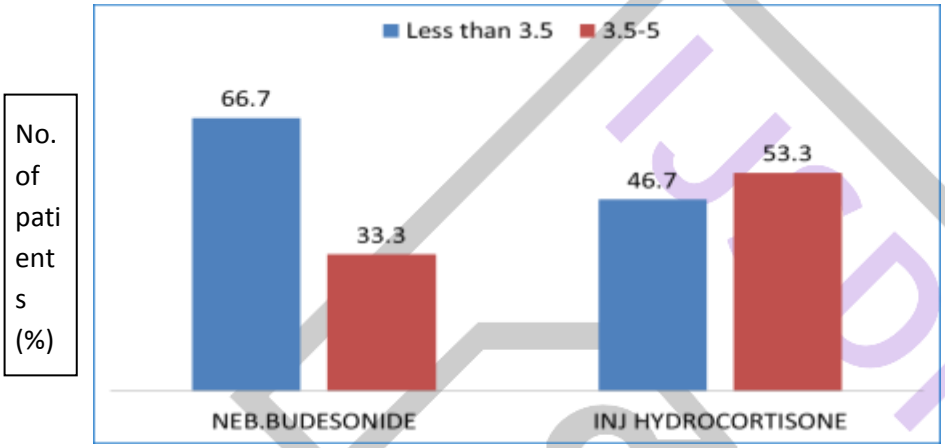
- DISTRIBUTION OF PATIENTS BASED ON QUALITY OF LIFE

Neb. BudesonideInj.Hydrocortisone

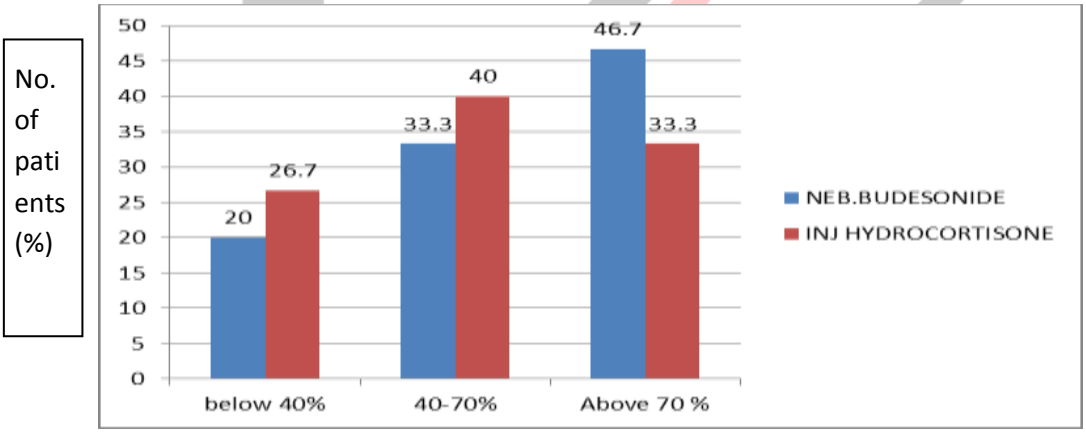




- COMPARITIVE STUDY BETWEEN NEB BUDESONIDE AND INJ HYDROCORTISONE IN RELATION TO HYPOKALEMIA



- COMPARITIVE STUDY BETWEEN NEB BUDESONIDE AND INJ HYDROCORTISONE IN RELATION TO QUALITY OF LIFE



CONCLUSION

- Corticosteroids caused a significant decrease in the potassium levels of patients.
- The comparative study between neb.budesonide and inj hydrocortisone in relation to hypokalemia level shows that the hypokalemia was more profoundly caused by neb.budesonideand thaninj hydrocortisone.
- The study also showed that the quality of life above 70% was higher in those patients who were using neb.budesonide than inj hydrocortisone.
- Most of the patients were found to be highly adherent to neb budesonide and inj hydrocortisone.

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