



# Impact of Chronic Renal Failure on Lung Functions -A Cross Sectional Study

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ABSTRACT

**BACKGROUND:** Chronic renal failure is a clinical syndrome of the metabolic and systemic consequences with a gradual and irreversible reduction in the excretory and homeostatic functions of kidneys. Renal failure may affect the lung functions directly (or) indirectly due to volume overload and acid-base balance. The pulmonary system is unique because it is affected by the renal disease and its treatment. **AIMS AND OBJECTIVES:**( i) To analyze the lung function in chronic renal failure (ii) to classify the type of respiratory disorder. **MATERIALS AND METHODS:** 30 cases and 30 controls were selected. Lung function test was done using spirometry. **RESULTS:** Findings were analysed using mean and standard deviation. Lung functions were reduced in chronic renal failure patients and mostly of restrictive type. **DISCUSSION AND CONCLUSION:** Lung function was reduced in chronic renal failure patients due to fluid overload and metabolic acidosis.

KEYWORDS

chronic renal failure, lung function, spirometry.

INTRODUCTION

Chronic Renal failure is characterised by slowly progressive irreversible loss of kidney function. The kidney has the ability to filter the plasma and remove substances from the filtrate at variable rates depending on the needs of the body which is called the glomerular filtration rate (GFR). Physiologically, renal failure is described as a decrease in the glomerular filtration rate (Guyton and Hall 10<sup>th</sup> edition ). Clinically, this manifests as an elevated blood urea nitrogen and serum creatinine level. The chronic renal failure may affect virtually every system in the body including the lungs(Massry & Glasscock et al). A functionally intact respiratory system is of vital importance for patients with renal insufficiency. The main problems in chronic renal failure patients are pulmonary edema due to an increased permeability of pulmonary capillaries, intra vascular and interstitial volume overload, hypertension and congestive heart failure. These changes cause altered physiological and mechanical function of the lungs and subsequently increase in airway resistance(Tkacova R et al ). Pulmonary complications of renal disease are extensively studied and well documented. But little is known about the effects of different forms of renal replacement therapy on lung function. Therefore this study was undertaken to evaluate the lung function tests in chronic renal failure using spirometry.

MATERIALS AND METHODS:

This was an observational cross sectional study in chronic renal failure patients treated in the nephrology ward of tertiary care hospital. The study was approved by institutional ethical committee. All participating patients formally agreed to submit to the study procedure by giving written informed consent prior to inclusion. Data collection was performed for three months duration.

Initially, clinical data were recorded on standardised investigation forms containing variables of interest for the study. Lung function assessment was performed by spirometry using computerised spirometer (Spirobank) and technical procedures, criteria for acceptability and reproducibility followed the guidelines of the American thoracic society and European respiratory society(American thoracic society update 1994).VC, FVC, FEV1, FEV1/FVC ratio, FEF 25-75% and PEFR were determined. The maneuver was performed 3 times and the highest value was used.

Two groups were recruited for this study in both sexes in the

age of 45 – 60 years, control group and study group. Control group comprised of 30 healthy volunteers (14 males and 16 females).Study group comprised of 30 adults (18 male and 12 females) diagnosed to have chronic renal failure under standard criteria. Patients with Signs and symptoms of renal failure more than 2 months in duration, Serum creatinine > 1.5mg% 'Blood urea > 60mg% were included in the study.

EXCLUSION CRITERIA

- Pre existing lung disease,
- Cardiac disease,
- Family history like asthma, allergies,
- History of contact with open tuberculosis,
- Non cooperation with test procedures were excluded from the study.

RESULTS

All the data collected were entered in Microsoft excel sheet and data analysed.P value calculated using mean and standard deviation.

TABLE 1 LUNG FUNCTION TEST IN BOTH GROUPS

LUNG FUNCTION TEST	GROUPS		
	STUDY MEAN ± SD	CONTROL MEAN± SD	P VALUE
Vital capacity(VC)	3.36 ±0.72	1.7± 0.6	0.0001*
Forced vital capacity(FVC)	3.15± 0.7	1.7± 0.5	0.0001*
Forced expiratory volume at one second (FEV1)	2.9 ±0.7	1.4± 0.5	0.0001*
FEV1%(FEV1/FVC X100)	91.3± 3.3	79.3± 2.9	0.0001*
Peak Expiratory Flow(PEF)(L/S)	3.07± 1.84	1.63± 0.81	0.0002*
Forced Expiratory Flow25-75%(L/S)	3.19 ±0.9	1.3± 0.5	0.0001*

\*extremely significant

**Discussion:** The pulmonary function test was done for both control group and chronic renal failure patients who were not having any obvious lung disease. In our study the pulmonary function test like VC,FVC, FEV1, FEV1%, PEF, FEF25-75% were significantly lower in chronic renal failure patients than the control group. *Kossowska et al* determined presence of ventilator disturbances is of restrictive type with decreased vi-

tal capacity, reduced maximal ventilation and lower one second forced expiratory volume but significant higher in residual volume. **Alves et al** had similar findings in her study. He determined that Forced vital volume (FEV1) and the forced vital capacity (FVC) gets altered before dialysis and gets corrected after hemodialysis. **Ferrer et al** also had similar findings in his study. He assessed lung function disturbances in patients with chronic renal failure patients and it improved significantly after hemodialysis. He speculated that interstitial lung oedema may play a significant role in lung function impairment.

This may be the direct result of uremic toxins or may result indirectly from volume overload, acid-base imbalances, alterations in respiratory drive, mechanics of breathing, respiratory muscle function and gas exchange (Herrero JA et al).

The present study in chronic renal failure patients showed that the lung function values were low in females than in males this finding correlated with other studies. **Gibson et al** also had similar finding. **Becklake et al** also supported our finding.

## CONCLUSION

To conclude the lung functions gets altered among chronic renal failure patients and it is of restrictive type as determined by spirometry. It was due to fluid overload and acid base disorder.

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