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Effect Of Hemodialysis On Lung Function In Chronic Renal Failure Patients A Longitudinal Study

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Abstract:

Background and Introduction: The most common cause of morbidity and mortality in developing countries are chronic diseases. Chronic renal failure (CRF) is one among the chronic diseases leading to a decreased quality of life. Chronic renal failure may eventually affect every system in the body including lungs due to acid-base imbalance. So this study was aimed to assess the pulmonary functions and also to study the effects of hemodialysis on lung function in chronic renal failure patients. **Materials & Methods**: 30 chronic renal failure patients in the age group of 45-60 years were selected for study group. The lung functions (FVC, FEV1, FEV1/FVC, FEF 25-75%) were carried out in these patients in predialysis and postdialysis period of 1day, 1week, 1month, 2months and 3months using spirometry. Cross sectional study was done. **Results:** The lung functions including VC, FVC, FEV1, PEF, FEF25-75% were significantly reduced in CRF patients but with regular hemodialysis for three months the values improved significantly(p value <0.05) but the values did not reach the level of the control group except FEV1%. The lung functions were significantly reduced in females when compared to males. **Conclusion**: The lung function parameters were significantly reduced in CRF patients who improved significantly after regular hemodialysis but were lower than the normal subjects.

Keywords: chronic renal failure, pulmonary functions, spirometry, hemodialysis

Introduction:

Renal diseases are among the most important cause of morbidity and mortality in most developing countries. Nearly 260 cases per million population were seem to be affected every year and about 70 million people of varying severity of renal disease was found in India.[1] The chronic renal failure may affect almost all systems of body including lungs due to metabolic complications that arise because of acid-base imbalance, pulmonary edema and pleural effusions. A functionally intact respiratory system is of vital importance for the patients with renal insufficiency.[2] The pulmonary system is unique because it is affected by renal disease and its treatment. In patients with chronic renal failure, pulmonary edema and pleural effusions attributed to fluid overload and an increase in pulmonary capillary permeability are relatively common. These complications reduce the pulmonary function which is reflected as low vital capacity, forced expiratory volume, lung diffusing capacity and maximal mid expiratory rate. Pulmonary complications of renal

disease are extensively studied and well documented. But little is known about the effects of hemodialysis on lung function tests in chronic renal failure. Kidneys are the chief organs of excretion and the primary function of the kidney is the maintenance of the constancy of the internal environment. Reduction in renal mass less than 40% causes impairment of function and severe reduction results in renal failure.[3] Chronic renal failure is the deterioration of renal function which occurs gradually over a period of months due to irreversible loss of large number of nephrons. It is a clinical syndrome of the metabolic and systemic consequences with a gradual and irreversible reduction in the excretory and homeostatic functions of kidneys. Chronic renal failure results in accumulation of fluid and waste products in the body, causing azotemia and uraemia.[4] Azotemia is the accumulation of nitrogen waste products in the blood which may occur without symptoms. Uremia is the state of ill health resulting from renal failure. Fluid retention and uraemia can cause further complications. Manifestations of CRF appear only when more than two-thirds of the nephrons have lost their function. Renal failure may affect the lung functions directly (or) indirectly via effect on other organs which can be studied by pulmonary function tests.[5]

Spirometry is safe and simple method to record such changes and for studying pulmonary ventilation and to record the volume of air moving into and out of the lungs. It is also used to classify respiratory diseases (Whether obstructive or restrictive), establish prognosis, suggest treatment and are research oriented. Nowadays computerized spirometers are used for the assessment of pulmonary function tests to measure a large number of functional respiratory parameters. The test results are compared with normal (or) predicted values based on American Thoracic Society guidelines.[6]

Aims and Objectives:

- To assess the pulmonary functions in chronic renal failure patients.
- To study the effects of hemodialysis on lung functions in chronic renal failure patients.

Materials and Methods:

After getting ethical committee clearance and patients consent the study was done in the clinical physiology lab, Department of Physiology, Coimbatore Medical College and in the Nephrology ward at Coimbatore Medical College Hospital, Coimbatore. A total of 60 subjects were recruited for this study in the age group 45-60 years (32 males and 28 females) which was divided into 2 groups-study and control group, comprising of 30 each.

Study group comprised of 30 adults (18 male and 12 females) diagnosed to have chronic renal failure under standard criteria that were planned for hemodialysis. They were further subdivided into 2(A), 2(B), 2(C), 2(D), 2(E), 2 (F) depending upon the duration of hemodialysis.

2(A) – Predialysis (chronic renal failure patients)
2(B) – One dialysis
2(C) – 1 Week dialysis
2(D) – 1 Month dialysis
2(E) – 2 Months
2(F) – 3 Months dialysis

The following parameters were recorded before and after each sitting of hemodialysis such as 1 day, 1 week, 1 month, 2 months and 3 months duration of repeated dialysis.

INCLUSION CRITERIA

- Signs and symptoms of renal failure of more than 2 months in duration.
- Serum creatinine > 1.5mgs%
- Blood urea > 60mgs%
- Patients of chronic renal failure diagnosed under clinical criteria who were all planned for hemodialysis therapy.

EXCLUSION CRITERIA

- Patients with pre existing lung disease.
- Patients with cardiac disease.
- Family history especially in relating to respiratory disorders like asthma, allergies, history of contact with open tuberculosis.

Pulmonary function tests such as FVC, FEV1, PEF, FEV1%,FEF25-75% were done using Spirobank (SPIROBANK-G) in forenoon before dialysis and another within 24 hours of dialysis in the sitting posture of the patient.

Results:

Statistical analysis was done using software SPSS 11.00 version. Mean and Standard deviation were calculated. Student 't' test was used to test the significance between the control group and study group. The significant difference of mean was analyzed using one way ANOVA. Post hoc comparisons were done using least significant different methods.

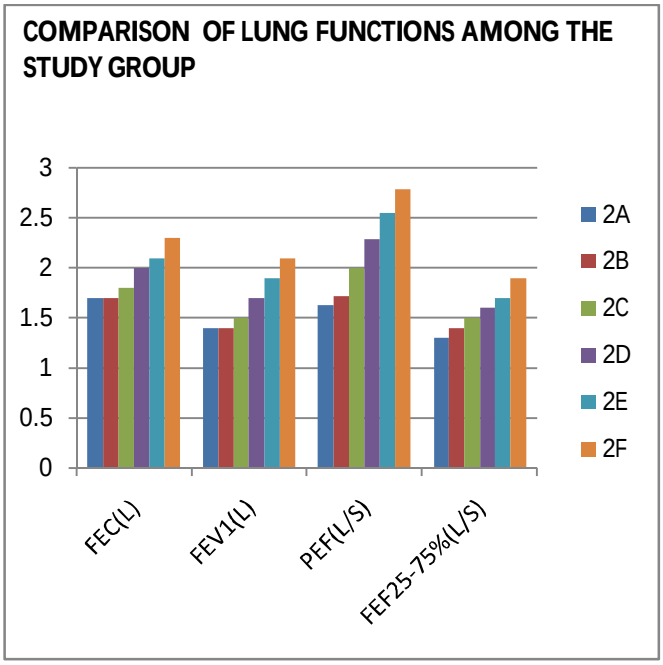
Table 1: Comparison of lung functions among the study group.

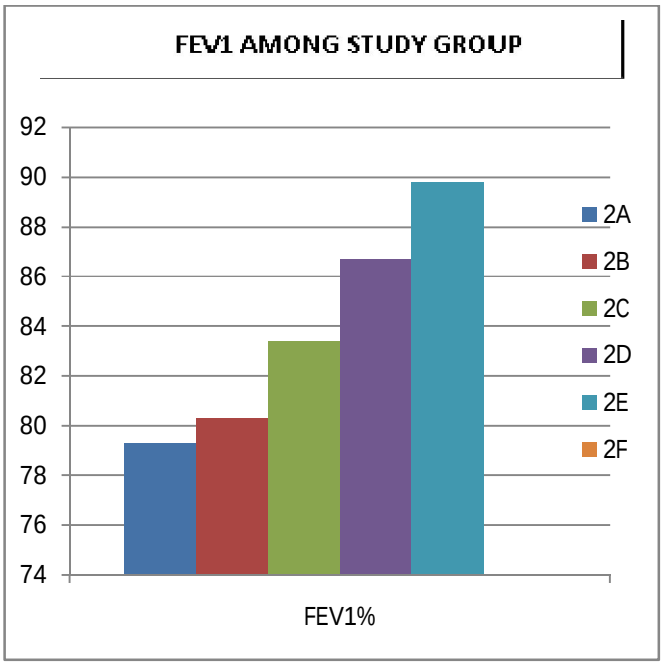
Sr. no.	Group	VC	F	FEV	FEV	PEF	FEF 25-75%
		Mean± SD					
1	2 (A)	1.72 ± 0.6	1.7 ±0.3	1.4 ±0.5	79.3 ± 2.9	1.63 ±0.81	1.3 ±0.5
2	2 (B)	1.72 ± 0.6	1.7 ±0.3	1.4 ± 0.4	80.3 ± 3	1.72 ±0.81	1.4 ±0.5
3	2 (C)	1.9 ± 0.6	1.8 ± 0.5	1.5 ±0.5	83.4 ±3.2	2 ±1.8	1.5 ±0.5
4	2 (D)	2 ± 0.6	2 ± 0.6	1.7 ± 0.5	86.7 ±3.4	2.29 ±0.77	1.6 ±0.5
5	2 (E)	2.1 ± 0.6	2.1 ± 0.6	1.9 ±0.5	89.8 ±3.3	2.55 ± 0.76	1.7 ±0.5
6	2 (F)	2.2 ± 0.6	2.3 ± 0.6	2.1 ±0.5	92.5 ±3.5	2.79 ±0.74	1.9 ±0.5
P value		<0.05* Highly significant for all parameters					

Table 2 Comparison of lung parameters among predialysis group and after 3 months of hemodialysis

Parameters	GROUP 2(A)	P value	GROUP 2(F)	P value
FVC(L)	1.71±0.5	0.000	2.26±0.6	0.000
FEV1(L)	1.44±0.5	0.000	2.02±0.5	0.000
FEV1%	79.3±2.9	0.000	92.5±3.5	0.180
PEF(L/S)	1.63±0.8	0.000	2.79±0.7	0.001
FEF25-75%(L/S)	1.36±0.5	0.000	1.89±0.5	0.000

Forced vital capacity values decreased in chronic renal failure patients. At serial hemodialysis, the forced vital capacity improved gradually by significant values after three months of repeated hemodialysis compared to the pre- dialysis values. P<0.05 was significant.





Discussion:

This study has shown that the pulmonary function test like FVC, FEV1, FEV1%, PEF, FEF25-75% were significantly reduced in chronic renal failure

patients. Alves J et al[7] had similar finding in his study. Wanic-Kossowska M et al[8] also had similar finding. Ferrer et al[9] had demonstrated in his study that bronchial reactivity in patients with chronic renal failure undergoing hemodialysis had similar reduction in lung functions. Putnam et al[10], Herrero JA et al[11] also showed reduction in lung functions. This may be the direct result of uremic toxins or may result indirectly from volume overload, anaemia, immune suppression, extraosseous disorders and acid-base imbalances, alterations in respiratory muscle function and gas exchange.

In our study there was no significant improvement in pulmonary function after a single dialysis. This may be due to a single hemodialysis would not have been sufficient to remove the fluid which would have accumulated in the interstitial lung tissue. But a significant improvement in pulmonary function after a single dialysis was documented in a study by Alves J et al.[7]

The present study has shown the improvement of FVC, FEV_1, FEV_1%, PEF and FEF 25-75% following 1 week duration of hemodialysis. There was a significant rise in there levels after 3 months duration of repeated hemodialysis. Bush A et al[12] also had similar finding that lung functions improved after 3 months of hemodialysis.

Though a mild increase in pulmonary function was observed with each dialysis, a significant improvement was seen after 3 months of repeated hemodialysis. Following repeated hemodialysis, the rise of pulmonary function values seems to significantly reduce interstitial pulmonary edema.

Our study showed that lung function in chronic failure patients was low in females. This finding correlated with other studies. Gibson GJ[13] had similar finding that lung functions were low in females. Beclake MR et al[14] in his study also had shown reduction in lung functions in females.

Conclusions:

The findings of this study indicate that the pulmonary functions were significantly reduced in chronic renal failure which subsequently improved after 3-4 sittings of hemodialysis and rises further with 3 months duration of hemodialysis. The reason behind may be that excess lung water is removed during the dialysis therapy; metabolic and electrolyte abnormalities are corrected, metabolic waste products are removed. The progression of chronic kidney disease to end stage renal disease is slowed significantly with the dialysis therapy. Dialysis therapy maintains the physical status of the renal failure patients to a normal range thus prolonging the quality of life of an individual.

Limitation:

This study has been carried out only in 30 chronic renal failure patients. A similar study with a large sample may yield better results and confirm the findings of this study. This study reflects only the effect of hemodialysis on lung function.

Future scope of the study:

This study included only the effect of hemodialysis on lung function. A similar study of other modalities of renal replacement therapy may yield interesting results. The effect of long term dialysis on pulmonary function in chronic renal failure patients may be undertaken in future.

References:

1. Moeller S, Gioberge S. ESRD patients in 2001: Global overview of patients; treatment modalities and development trends. Nephrol Dial Transplant 2002;17:2071-6.
2. Willroth PO, Tredt HJ. Airway resistance in dyalisis patients. Z Gesamte Inn Med. 1986;41(2):48-50.
3. Guyton & Hall- Text book of Medical Physiology 10th Ed:436-7.
4. Massry & Glassock. The text book of kidney disease 3rd Ed:1364-6.
5. Andrew Bush, Roger Gabriel. Pulmonary function in chronic renal failure: effects of dialysis and transplantation. Thorax 1991;46:424-8.

6. American Thoracic Society-Standardization of spirometry.1994 update. Am J Resg & Critical Care Med 1995;152:1107-367.
7. Alves J, Hespanhol V, Fernandes J, Marques EJ. Spirometric alterations caused by hemodialysis. Their relation to changes in the parameters commonly used to measure hemodialysis efficiency. Acta Med Port 1989;2(4-5):195-8.
8. Wanic-Kossowska M. Effect of peritoneal dialysis and hemodialysis on respiratory function in patients with chronic renal failure. Pol Arch Med Wewn 1991;85(5):303.
9. Ferrer A, Roca J, Rodriguez-Roisin R, Lopez-Pedret J, Revert L. Bronchial reactivity in patients with chronic renal failure undergoing haemodialysis. Eur Respir J 1990;3(4):387-91.
10. Putnam JS. The effect of hemodialysis on lung functions, gas exchange and response to carbondioxide stimulation in chronic uremi. Am J Med Science 1977;273(1):87-93.
11. Herroro JA, Alvarez JL, Coronel F, Moratilla C, Gamez C, Sanchez-Alarcos JM. Pulmonary diffusing capacity in chronic dialysis patients. Respir Med 2002;96(7):487-92.
12. Bush A, Gabriel R. Pulmonary function in chronic renal failure: Effects of dialysis and transplantation. Thorax 1991;46:424-8.
13. Gibson GJ, Pride NB, O'Cain C, Quagliato R. Sex and Age differences in pulmonary mechanics in normal non-smoking subjects. J Appl Physiol 1976;41(1):20-5.
14. Beclake MR, Kaufmann F. Gender differences in airway behavior over the human life span. Thorax 1999:1119-38.