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Role of Hemodialysis in Renal Failure to Correct Biochemical Parameters

KEYWORDS: Renal failure, Hemodialysis, Sodium, Potassium

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ABSTRACT *AIM: To study the role of hemodialysis in renal failure to correct biochemical parameters i.e. serum sodium, serum potassium, serum urea and serum creatinine levels.*

METHODS: 50 patients of acute renal failure and 100 patients of chronic renal failure, above 18 years age are selected in this study. These patients underwent conventional HD for an average of six hours. The serum potassium, serum sodium, serum urea, and serum creatinine level were measured in a blood sample obtained just before and after routine dialysis session. all samples were immediately analyzed using standard laboratory techniques.

RESULT: Serum sodium does not have significant post dialysis change. but serum potassium, serum creatinine and serum urea have significant post dialysis change.

CONCLUSION: Hemodialysis is a prefer technique to correct biochemical abnormalities in renal failure at tertiary center and it is cost effective.

INTRODUCTION

In medicine, dialysis (from Greek "daklusis", meaning dissolution, "dia", meaning though and lysis, meaning loosening is primarily used to provide an artificial replacement for lost kidney functions in people with renal failure. Dialysis may be used for those with an acute disturbance in kidney function or for those with progressive but chemically worsening kidney function a state know as chronic renal failure. [1]

Dialysis is regarded as a "holding measure" until; a renal transplant can be performed or sometimes as the only supportive measure in those for whom a transplant would be inappropriate.[2]

Estimation of serum sodium and potassium is of importance in cases of renal failure because kidney regulate and maintain a narrow range of electrolyte fluctuation (Hyperkalemia is one of the complication of renal failure).[3]

Hemodialysis is one of the effective means of treatment of hyperkalemia, uremia, also to correct sodium and serum creatinine levels in renal failure.[4]

Present study was done to access the changes in serum sodium and serum potassium level in pre and post renal dialysis patients.

AIMS & OBJECTIVES

1. To find out the epidemiological parameters responsible for renal failure in Government Hospital.
2. To find our commonest etiological factor in patient of renal failure in Government Hospital.
3. To study the role of hemodialysis in renal failure to correct biochemical parameters i.e. serum sodium, serum potassium, serum urea and serum creatinine levels.
4. To compare the results observed with the work done by other workers in India and abroad.

MATERIAL & METHODS

- ➢ Easylyte instrument.
- ➢ Other materials
  - o Syringe with Needle
  - o Spirit swab.
  - o Cuff
  - o Vacutte (red topped)
  - o Cuvettes
  - o Pipettes- 10 µl, 100 µl, 1000µl.
  - o Test - tubes 100 mm 12 mm.

Selection of patients:

Total 150 patients above the age of 18 years were selected. Two groups of patients were:

(a) 100 patients with chronic renal failure(CRF): who received hemodialysis (HD) for more than>3 months.

- 33 patients were of diabetes.
- 12 patients were hypertensive
- 02 patients were of polycystic kidney disease.
- 14 patients were of obstructive nephropathy.
- 01 patients were of myeloma.
- 08 patients were of diabetes + hypertension.

(b) 50 patients with acute renal failure(ARF):

- 26 patients were of acute gastroenteritis.
- 04 patients were of falciparum malaria.
- 05 patients were of acute on chronic renal failure
- 05 patients were of septicemia.
- 02 patients were of snake bite.
- 02 patients were of trauma.
- 06 patients were of unknown cause.

- ❖ Verbal consent was taken from all patients. All patients were dialyzed at the GURU GOVIND SINGH hospital hemodialysis unit using NIPRO Hemodialysis machine. These patients underwent conventional HD for an average of six hours. The blood flow rate during HD was 300-350 mL./ min. The dialysate composition was : sodium 140 mEql/L, potassium 2.5 mEq/L, bicarbonate 34mEq/L, acetate 3.0 mEq/L, chloride 109 mEq/L, calcium 3.0mEq/L, magnesium 1.0mEq/L, glucose 1 g/L.
- ❖ The serum potassium and serum sodium were measured using EASYLYTE instrument. Serum urea was measured using the BERTHELOT method and serum creatinine levels were measured using CLORIMETRIC KINETIC test. The serum potassium, serum sodium, serum urea, and serum creatinine level were measured in a blood sample obtained just before and after routine dialysis session. Laboratory measurements were performed without any delay after sample collection. All samples were immediately analyzed using standard laboratory techniques.
- ❖ Data were analyzed using Medcalc software. Data were

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expressed as mean ± SD. And Paired T- test was used to calculate significance of difference.

RESULTS:

- SEX DISTRIBUTION AMONG PATIENTS WITH CRF:

The 100 study patients comprised 36 females and 64 males with male: female ratio was 1.8:1.

- AGE GROUP INCIDENCE IN CRF PATIENTS:

The maximum incidence of chronic renal failure was in the age group of 41-50 years (26%) followed by the age group of 51-60 years (24%) followed by the age group of 31-40 years (20%). The minimum incidence was below 20 years of age (6%) the incidence was more or less similar in remaining age groups.

Mean age of 44.4±13.3 years (range from 19-74 years)

- AETIOLOGICAL FACTORS IN PATIENTS WITH CRF:

This study shows that diabetes was the leading cause of CRF in the present study, with the incidence of 33% followed by unknown causes (30%), obstructive uropathy (14%), hypertension (12%). Other causes includes diabetes + hypertension (8%), polycystic kidney disease (2%) and myeloma (1%).

Table 1
SHOWS PREHMODIALYSIS AND POST HEMODIALYSIS BIOCHEMISTRY LEVELS IN PATIENTS WITH CRF

Range	$S.Na^+$ mEq/L	$S.K^+$ mEq/L	S.urea mg%	S.creat. mg%
Pre H/D	129 - 168	4-7.7	29-141	3.94-7.60
Post H/D	131-11	2.9-4.1	22-89	2.05-4.56
Mean ± S.D. Pre H/D	140.3 ± 5.9	5.4 ±0.5	77.1 ±14.2	6.14 ±0.71
Mean ± S.D. Post H/D	139.6 ± 4.6	3.5 ±0.3	37.2 ±11.4	3.19 ±0.55
t-test	0.936	32.58	21.91	31.99
P- value	0.35	< 0.0001	<0.0001	<0.0001

S.D.- Standard Deviation,

H/D-Hemodialysis.

- Above table statistically shows serum sodium does not have significant post dialysis change. but serum potassium, serum creatinine and serum urea have significant post dialysis change.
- Table shows that the mean pre- dialysis and post-dialysis serum sodium was 140.3mEq/L and 139.6 mEq/L with S.D. of 5.9mEq/L and 4.6 mEq/L respectively. The mean ± S.D. at pre - dialysis and the mean ±S.D. of post - dialysis serum potassium , serum creatinine and serum urea were 5.4± 0.5 mEq/ L and 3.5±0.3 mEq/L; 6.14±0.71 mEq/L; 77.1 ± 14.2 mEq/L and 37.2 ± 11.4 mEq/L respectively.

❖ **SEX DISTRIBUTION AMONG PATIENTS WITH ARF:**

The 50 study patients comprised 29 males and 21 female. Male : female ratio is 1.4:1.

❖ **AETIOLOGICAL FACTORS IN PATIENTS WITH ARF:**

This study shows that acute gastroenteritis was the leading cause of ARG in the present study, with the incidence of 56% followed by unknown causes (12%), followed by the similar incidence of acute on chronic renal failure (10%) and septicemia (10%). Other causes include falciparum malaria (8%) and trauma (4%).

TABLE 2
PRE-HEMODIALYSIS AND POST HEMODIALYSIS BIOCHEMISTRY LEVELS IN PATIENT WITH ACUTE RENAL FAILURE:

Range	$S.Na^+$ mEq/L	$S.K^+$ mEq/L	S.urea mg%	S.creat. mg%
Pre H/D	132-170	5.1-7.5	107-260	7.79-14.02
Post H/D	133-152	3.0-4.0	52-93	3.89-7.11
Mean ± S.D. Pre H/D	142 ± 7.2	6.5 ± 0.5	174.3 ± 28.3	11.68 ± 1.77
Mean ±S.D. Post H/D	141 ± 5.0	3.6 ± 0.2	76.6 ± 9.8	5.14 ± 0.84
P- Value	0.42	<0.0001	<0.0001	<0.001
T-test	0.80	38.07	23.06	23.47

S.D. = Standard deviation,

H/D = Hemodialysis.

- Above table statistically shows serum sodium does not have significant post dialysis change. but serum potassium, serum creatinine and serum urea have significant post dialysis change.
- Table shows that the mean pre- dialysis and post- dialysis serum sodium was 142 mEq/L and 141 mEq/L with S.D. of 7.2 mEq/L and 5.0 mEq/L respectively. The mean ± S.D. at pre-dialysis and the mean ± S.D. of post - dialysis serum potassium, serum creatinine and serum urea were 6.5± 0.5 mEq/L and 3.6 ± 0.2 mEq/L ; 11.68 ± 1.77 mEq/L ; 174.3 ± 28.3 mEq/L and 76.6 ± 9.8 mEq/L respectively.

Other Related studies of biochemical changes before and after hemodialysis in chronic renal failure:

1. Agrakhar et al (2003)[5]
2. Tarif N, Yamani H et al. (2008)[6]
3. Ahmad Z (2010)[7]
4. A.Blumberg, H.W. Roser et. al. (1997)[8]
5. Malhis M et al (2010)[9]
6. M House et al (2002)[10]

Other Related studies of biochemical changes before and after hemodialysis in Acute renal failure:

1. Valentine Lobo et al (2004)[11]
2. PJ Shelgkar et al (2005)[12]

Results of this study are consistent with other related study mentioned above.

CONCLUSION

- Acute renal failure and chronic renal failure is still the disease of middle aged males.
- The commonest etiological factors for CRF are diabetes, hypertension and obstructive cause.
- The commonest etiological factors of ARF is gastroenteritis.
- Hemodialysis is a prefer technique to correct biochemical abnormalities in renal failure at tertiary center and it is cost effective.
- Serum sodium does not have significant post dialysis change, but serum potassium, serum creatinine and serum urea have significant post dialysis change.

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