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Study of serum urea in the patients of chronic renal failure

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ABSTRACT

The human body suffers from more than one famous and dangerous disease and may loss his life when he doesn't get the treatment within suitable time. Chronic Renal Failure is one of the most spread diseases in the entire world and it is more dangerous and ranks 3rd amongst life threatening disease, after cancer and heart diseases. In this case the renal does not work properly and never do its function. The best treatment in this case is to do the process of hemodialysis. In this process, the blood will be refreshed and remove the waste and toxic materials from the body and at the same time returned the level of some biochemical element to its normal value. The present paper includes the study of serum urea of 200 patients (according to age group and sex) with chronic renal failure (CRF) before and after the process of treatment and it has been compared with 50 normal healthy individuals comprising the control group.

Key Words: Chronic Renal Failure, Dialysis, Serum Urea

1. INTRODUCTION

Renal system is one of the major systems of human body beside cardiovascular, pulmonary, hepatic and central nervous system. Kidney is the main organ of renal system. It contains nephrons which are the main unit of kidney. Each kidney is composed of approximately one million nephrons. Kidney is responsible for maintaining body's electrolyte balance, pH, water content of the body, tonicity of the body fluids, normal acid-base balance of the body fluid and filtering the waste metabolic products. In modern world of changes and challenges, morbidity and mortality

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renal failure has become a serious cause of concern. Chronic Renal Failure (CRF) is a disease of insidious onset and progressive course with gradual deterioration of renal function and of such severity that the kidneys are no longer be able to keep the internal environment normal. Shaughnessy et al. (2005) suggested that renal suffer from more diseases such as Glomerular disease, Tubular disease, Urinary tract infection, Urinary tract obstruction, renal calculi, cystic disease, vascular disease, Tumors and Renal Failure. Lise et al. (2009) studied that renal failure occurs when the kidneys cannot properly remove wastes that causes buildup of waste and fluid in the body. Swelling in the hands, face or feet, Nausea or vomiting, Loss of appetite, Changes in urination, Itching of the skin, Headache and confusion, Fatigue and weakness etc are the signs which have been observed by Fiaccadori et al. (2001). Stenvinkel et al. (2002) reported that chronic renal failure (CRF) is one of the most severe diseases worldwide. End-Stage Renal Disease (ESRD) is the final stage of CRF which is a progressive, irreversible deterioration in renal function in which the body ability to maintain fluid and electrolyte balance fails. Chronic renal failure can lead to multiple medical and physical problems require physical therapy treatment. The purpose of this paper is to provide an understanding of the medical treatment and the complications of chronic renal failure. The physical therapy management of the patient on dialysis and that of the patient with a kidney transplant differs as to the extent and aggressiveness of the program. Providing the proper physical therapy program for patients with chronic renal failure is often a challenge because of such complications as congestive heart failure and peripheral neuropathies studied by Paula et al. 1982. Stevons et al. 1970 reported approximately 50 persons per million populations suffer from chronic renal failure. In Britain, approximately 55 new patients per million of the adult population progress to terminal renal failure each year. (Davidson's XV edition) Severity of renal failure is common feature now a day in India. It is conceivable that the figures would be comparable to those reported from the west. This would mean an incredible figure of 30,000 persons with chronic renal failure every year in India alone. Keeping in view the above mentioned facts, the present paper is planned to evaluate the serum urea level in the management of chronic renal failure patients and also to study the prognostic significance of these parameters.

2. EXPERIMENTAL

2.1. Materials and methods

The present study was carried out on 200 adult patients of chronic renal failure attended in the S.V.B.P. hospital attached to L.L.R.M. Medical College, Meerut and also 50 normal healthy individuals with age, sex matched who had no history of renal failure to serve as controls. All the known cases of chronic renal failure were included in this study on the basis of clinical and biochemical criteria. A known case of renal failure for more than three months duration (Harrison IX edition. Page 1284) and persons having blood urea more than 50 mg% were chosen for study. After confirmation of diagnosis on the above parameters, blood samples were drawn from these patients for the estimation of serum urea. All the chemicals and reagents used were of analytical grade: otherwise they were purified before use. Urea on heating with diacetyl gives coloured compounds. Both diacetyl and its monoxime have been used. This method has been adopted for autoanalyser.

2.2. Observations

Out of 50 control cases, 34 (68.0%) cases were males and 16 (32.0%) were females. 54.0% were found in the age group 51-70 years, 36.0% were 31-50 years age group and 10.0% were 10-30 years age group (Table 1 & Table 2). The majority of chronic renal failure cases were among more than 6 months- 1 year duration (114 cases, 57.0%) and then more than I year children (44 cases, 22.0%), (Table 3). In healthy subjects, serum urea ranged as 20-40 mg/dl (mean 32.71±4.70 mg/dl). In males, the range was 20-40 mg/dl (mean 33.41±4.82 mg/dl) and in females, the range was 20-36 mg/dl (mean 31.22±4.04 mg/dl), (Table 4). The highest urea level was observed in the age group of 31-50 years, ranged as 26-40 mg/dl (mean 33.54±4.39 mg/dl) followed by the age group of 10-30 years, ranged as 20-40 mg/dl (mean 33.40±7.17 mg/dl) and the age group of 51-70 years, ranged as 20-39 mg/dl (mean 32.04±4.18 mg/dl) respectively. No significant difference was seen among the serum urea levels of different age groups and sexes.

In chronic renal failure cases, serum urea level before and after fifteen, thirty, sixty and ninety days of treatment ranged as 150-180 mg/dl (mean 122.32±39.47 mg/dl), 45-105 mg/dl (mean 79.08±18.29 mg/dl), 41-87 mg/dl (mean 63.24±14.79 mg/dl), 40-70 mg/dl (mean 61.56±7.10 mg/dl) and 35-60 mg/dl (mean 52.88±6.03 mg/dl) respectively. Serum urea levels were significantly raised before and after fifteen, thirty, sixty and ninety days of treatment in all cases of chronic renal failure as compared to controls.

3. DISCUSSION

Chronic renal failure is the disease in which kidney are no longer able to keep the internal environment normal. The alterations in biochemical and clinical signs and symptoms have become more and more questionable. Now a days with the help of dialysis and renal transplantation, the profile of chronic renal failure has changed to a great extent.

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Table 1

Showing distribution of C.R.F. cases according to age group and sex

Age Groups (Years)	Number of cases		Total
	Males	Females	
10-30	5	2	7(3.5%)
31-50	50	25	75(37.5%)
51-70	63	40	103(51.5%)
71-above	10	5	15(7.5%)
Total	**128(64.0%)**	**72(36.0%)**	**200(100.0%)**

Table 2

Showing distribution of control cases according to age group and sex

Age Groups (Years)	Number of cases		Total
	Males	Females	
10-30	4	1	5(10.0%)
31-50	12	6	18(36.0%)
51-70	18	9	27(54.0%)
Total	**34**	**16**	**50(100.0%)**

Table 3

Distribution of C.R.F. cases according to duration of illness

Duration of illness	No. of cases	Percentage %
3 months-6 months	42	21.0%
6 months-1 year	114	57.0%
More than 1 year	44	22.0%
Total	**200**	**100.0%**

Table 4

Serum urea level in normal healthy control

Age in yrars	Male			Female			*Total*		
	No.	Range (mg/dl)	Mean=S.D.	No.	Range (mg/dl)	Mean=S.D.	No.	Range (mg/dl)	Mean=S.D.
10-30	4	20-40	33.50±8.01	1	20-40	33.00±3.05	5	20-40	33.40±7.17
31-50	12	26-40	35.25±3.98	6	26-40	30.11±2.92	18	26-40	33.54±4.39
51-70	18	20-39	32.17±3.91	9	20-39	31.78±4.68	27	20-39	32.04±4.18
Total	**34**	**20-40**	**33.41±4.82**	**16**	**20-39**	**31.22±4.04**	**50**	**20-40**	**32.71±4.70**

Table 5

Serum Urea Levels Before and After Treatment in Total Cases of Chronic Renal Failure

Interval	No. of Cases	Serum Urea	
		Range (mg/dl)	Mean = S.D.
Control	50	20-40	32.52±4.71
Before treatment	200	150-180	122.32±39.47***
15 days after treatment	186	45-105	79.08±18.29***
30 days after treatment	169	41-87	63.24±14.79***
60 days after treatment	145	40-70	61.56±7.10***
90 days after treatment	122	35-60	52.88±6.03***

P- Significance, control vs treatment

*p < 0.05, **p < 0.01, ***p < 0.001

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The longevity of patients of chronic renal failure has substantially increased with the treatment by dialysis and renal transplantation. Hemodialysis (HD) is by far the most common method employed for renal failure management as it offers a more rapid change in plasma solute composition and the possibility of more rapid removal of excess body water than peritoneal dialysis that is approximately one-eighth as efficient as HD in altering blood solute composition and about one fourth as efficient in terms of fluid removal. Lawrence et al. 2010 studied that the concentration of urea in the blood depends on a balance between its production from exogenous protein and it's excreted by the kidney. The purpose of present study is to find out some biochemical procedures which may be helpful in making the diagnosis of chronic renal failure and monitoring the prognosis of disease and find out any biochemical abnormalities in the patients of chronic renal failure.

The present study is conducted on a total of 250 individuals, out of which 50 are normal healthy individuals comprising the control group and rest 200 is of chronic renal failure. Results of biochemical parameter like serum urea from this study are discussed below-

Controls: Out of 50 healthy controls, 34 (68%) controls were males individuals and rest 16 (32%) were females. In normal healthy controls, serum urea ranged from 20-40 mg/dl (mean 32.71±4.70 mg/dl). In males it ranged from 20-40 mg/dl (mean 33.41±4.82 mg/dl) and in females it ranged from 20-39 mg/dl (mean 31.22±4.04 mg/dl). The highest serum urea level was observed in the age group of 31-50 years (mean 33.54±4.39 mg/dl) followed by the age group of 10-30 years (mean 33.40±7.17 mg/dl) and in the age group of 51-70 years (mean 32.04±4.18 mg/dl). No significant difference was found in normal healthy controls of individuals of different age group and sexes. Hoffman 1964 reported 95% of normal healthy subjects had serum urea levels ranging between 25-35 mg/dl (mean 32.10±4.06 mg/dl). Our findings are close to those reported as normal by Wright et al. (1945), Mitra et al. (1948), Mittal et al. (1950), Aggarwal et al. (1953), Marston et al. (1952) and Rice et al. (1960), (serum urea levels are 17-43, 20-50, 25-35 mean 29.5, 17.5-40.9, 20-40 and 20-35 mg%) respectively. Aggarwal et al. (1978) reported that normal healthy subjects had serum urea levels between 24-38 mg%.

Study Group: Out of 200 individuals, 128 (64%) controls were males individuals and rest 72 (36%) were females. All the 200 individuals were between the age group of 10 above 70 years. The maximum number of cases, 103 (51.5%), were observed in the age group of 51-70 years followed by 75 (37.5%) cases in the age group of31-50 years, 15(7.5%) cases in the age group of above 70 years and 7 (3.5%) cases in the age group of 10-30 years. It is observed that the incidence of chronic renal failure reaches its maximum strength during middle age and later part of life.

Biochemical Studies: No significant difference on account of age and sex was found in the present study. In case of chronic renal failure, serum urea was found increased in 100% cases. Before treatment, the level of serum urea was 122.32±39.47 mg/dl. Which was significantly high ($p < 0.001$) as compared to controls 32.52±4.71 mg/dl. Raymond et al. 1988, Avram et al. (1983) and Collins et al. (1994) also observed a significant increase in the level of serum urea. After 15 days of treatment, the level of serum urea decreased to 79.08±18.29 mg/dl. But still it was significantly high ($p < 0.001$) as compared to controls. After 30 days of treatment, the level of serum urea decreased to 63.24±14.79 mg/dl. This was significantly high ($p < 0.001$) as compared to controls. After 60 days of treatment, the level of serum urea decreased to 61.56±7.10 mg/dl. This was significantly high ($p < 0.001$) as compared to controls. After 90 days of treatment, the level of serum urea was declined to 52.88±6.03 mg/dl which was significantly high ($p < 0.001$) as compared to controls. The level of serum urea remained significantly high throughout the follow -up. In the present study, only 122 cases out of 200 cases turned up for follow-up to the last. This figure was low, because most of the cases defaulted in treatment.

4. SUMMARY AND CONCLUSIONS

There was significant difference in the levels of serum urea as regard to the age or sex of the healthy controls included in this study. The levels of serum urea were found to be significantly increased in cases of chronic renal failure as compared to that of controls and it remains increased throughout the follow-up. Maximum probabilities of chronic renal failure were found in the age group 51-70 years (51.5%). Minimum probabilities of chronic renal failure were found in the age group 10-30 years (3.5%). Now a day's dialysis and haemodialysis are the most important methods of treating renal failure as giving the patient kidneys clean of impurities and toxins and it is easily available and inexpensive for the patient without affects the efficiency of the remaining life of the patient. This method is easier and cheaper compared with the kidney transplants. The chronic renal failure is the most important disease that caught the kidney and destroys the activity of the body. According to this disease the function of kidney will be non-regular and consequently most of the level of biochemical element in the body will be changed.

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