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VARIATION OF SERUM UREA AND CREATININE LEVELS IN CKD PATIENTS IN EARLY MORNING AND AFTERNOON SAMPLES

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ABSTRACT

Objectives: The aim is to study variation of serum urea and creatinine levels in CKD patients in early morning and afternoon samples.

Study Design: Observational & prospective.

Place and Duration of Study: The study was carried out in Department of Biochemistry and MGM Medical College and Hospital, Kamothe, Navi-Mumbai .

Methodology: Total 80 subjects comprising of male and female aged between 30 to 60 years were recruited in the study after obtaining informed written consent. The serum levels of urea, and creatinine were estimated two times a day at morning 8am-9am and afternoon 2pm-4pm. The mean serum urea level and serum creatinine level at various durations was compared using one way ANOVA.

Results: In our study, we have not observed any significant variation in the case of serum urea and creatinine levels in morning and afternoon samples in CKD patients.

KEYWORDS : .

INTRODUCTION

A variety of biological variables oscillate within an organism including: behavior, physiological functions; and biochemical factors. If any event within a biological system recurs at approximately regular intervals, it is generally referred to as a biological rhythm [1,2].

Many of our biological and behavioral functions experience variations throughout the day, including: posture, sleep, body temperature, alertness levels and mental and physical performances. Many of these functions vary systematically in a cycle of about 24 hours and are called "circadian rhythms" (from the Latin words "circa" which means "about" and "dies" which means "a day").[3] These circadian variations are governed by a biological clock located in the brain. The mechanism underlying circadian rhythms is called the "biological clock" or the "circadian clock." Research has shown that the biological clock is located in the suprachiasmatic nucleus of the hypothalamus. The biological clock is probably the result of human evolutionary adaptation to the solar day [4].

Present study has been carried out for diurnal variations for two major NPN components urea and creatinine which are routinely determined in clinical settings .Finding of diurnal variations may help to assess whether these changes are of significant magnitude to require wider recognition and possible adjustment while interpreting clinical results.

MATERIALS AND METHODS

Sources of the data

The study was carried out in age group of 30-60 years selected from Nephrology Department of MGM Hospital, Kamothe diagnosed with Chronic Kidney Disease.

The present study was the observational prospective study, carried out in the Department of Biochemistry, MGM Medical College, Kamothe , Navi Mumbai, study duration between period of February 2016 to February 2017.

Sample collection

Blood sample

In a plain vial, 4 ml of blood samples from Chronic Kidney Disease patients were collected twice in a day, in the morning at 8:00am-9:00 am and afternoon 2:00 pm- 4:00 pm from each subject by venipuncture under strict aseptic precautions and standard blood collection techniques. After clotting serum was separated for further analysis.

Inclusion criteria:

1.Patients with CKD having GFR <60 ml/min.
2.Patients of 30-60 years age group.

Exclusion criteria:

1.Age less than 30 yrs and more than 60 yrs.
2.Chronic Liver Disease
3.Any chronic inflammatory disease
4.Malnutrition
5.HIV patient
6.Rheumatoid arthritis
7.Sepsis
8.Asthma
9.Malignancy
10.Pregnant women
11. Patients undergoing dialysis on the same day

All CKD patients were enrolled and a written informed consent was taken . The proforma included, name, age, sex, dietary habit (vegetarian/non-vegetarian), personal history of disease (if any), smoking habit, drinking habit, socio-economic status and occupation.

Methodology:

Estimation of Serum Urea: Urease method on Semi-auto analyzer.
Estimation of serum creatinine: Modified Jaffe's method on Semi-auto analyzer.

RESULTS

Table:1 Agewise distribution of subjects (in Years)

Age Group (in years)	No. of patients	Percentage
30-35	12	15 %
36-40	14	17.50 %
41-45	9	11.25 %
46-50	11	13.75 %
51-55	9	11.25 %
56-60	25	31.25 %
Total	**80**	**100 %**

TABLE 1. Mean Age 40.5 years, SD = 23.237 years, Min. = 30 years, Max. = 60 years

The above table shows distribution of patients with age. Out of 80 participants included in this study, 12 (15.0%) were in the age group 30-35 years, 14 (17.5%) in the age group 36-40 years, 9 (11.25%) in the age group 41-45 years, 11 (13.75%) in the age group 46-50 years, 9 (11.25%) in the age group 51-55 years and 25 (31.25%) were in the age group 56-60 years. 41-45 age group and 51-55 age group have least number of male and female, while maximum number of male and female are in age group 56-60 years.

Table: 2 Comparison of Serum Urea in morning and afternoon samples

Serum Urea (mg/dl)	No.	Morning		Afternoon		p-value
		7:00- 9:00 am		2.00-4:00 pm		
	80	Mean	SD	Mean	SD	0.796
		113.97	37.26	115.52	38.1	

Table: 2 shows serum urea levels of total 80 subjects in morning and afternoon samples. In morning samples, serum urea level is 113.97±37.26 mg/dl, while in afternoon samples it is 115.52±38.1 (mg/dl). On comparison, the value of serum urea are statistically non-significantly increased in afternoon samples as compared to morning samples (P=0.796).

Table:3 Comparison of Serum Creatinine in morning and afternoon samples

Serum Creatinine (mg/dl)	No.	Morning		Afternoon		P Value
		7:00- 9:00 am		2.00-4:00 pm		
	80	Mean	SD	Mean	SD	0.583
		8.60	3.47	8.91	3.61	

Table :3 shows serum Creatinine levels of total 80 subjects in morning and afternoon samples. In morning samples, serum Creatinine level is 8.60±3.47 mg/dl, while in afternoon samples it is 8.91±3.61 (mg/dl). On comparison ,the value of serum creatinine are statistically non significantly increased in afternoon samples as compared to morning samples (P=0.583).

DISCUSSION

In present study serum levels of urea, and creatinine of morning and afternoon in Chronic Kidney disease patients were estimated. Changes in serum levels of urea and creatinine in Chronic Kidney disease patients were studied.

The present study includes total 80 Chronic Kidney disease patients. The serum levels of urea and creatinine were estimated twice a day i.e. first in morning hours between 7:00 am -9:00 am and second time during afternoon hours between 2:00 pm-5:00 pm. Serum samples collected in the morning were fasting blood samples where as afternoon blood samples were non-fasting. Comparison of each urea and creatinine during these durations were made. In present study time of day when the serum samples were collected has been considered as an important factor in order to report findings of diurnal variations.

Within the general field of chronobiology and human circadian rhythms, there have been numerous investigations into the diurnal variation in routine serum biochemistry.

In present study serum urea levels were analyzed twice a day. The mean serum urea level at various durations was compared using one way ANOVA. The result indicated that there is no significant difference in the mean urea level at various durations ($p>0.05$). Serum urea comparison were made and showed 1.36% increase in afternoon serum urea level compared to morning level. These variations were not significant.

Our findings for serum urea levels are in accordance with Eaton and Lois although not of such magnitude as to be of practical significance the blood urea concentration of normal individual undergoes fluctuations during the day.[5]

Our studies for serum urea levels are in accordance with Bernard E. Statland, Per Winkel, and Henning Bokelund. In their study serum urea ratios of serum values (11:00 h/08:00 h) on day of exercise showed insignificant increase at 11:00 h compared to 08:00 h.[6] Also, the mean values for serum urea sample collected at 11:00 fasting and 14:00 h after meal showed insignificant increase in their level.[6] We have observed a non significant increase in serum urea level that may be due to dietary protein which is in accordance with other studies.

For serum creatinine levels at various durations were compared using one way ANOVA. The results indicated that there is no significant difference in the mean creatinine level at various durations ($p>0.05$).

We observed 3.6% non significant increase in serum creatinine level in afternoon compared to morning serum creatinine. It may be due to the increase in creatinine as the outcome of postural muscle activity, physical activity and energy output that is more in the afternoon compared to that during morning.

Serum creatinine concentration depends upon the balance between the production of creatinine and its excretion by the kidneys. In addition serum creatinine concentration is related to glomerular filteration rate in a reciprocal fashion; when renal function is normal or only mildly impaired, small changes in serum creatinine concentration represent large changes in GFR.[7]

Our findings for serum creatinine are in accordance with SJ Pocock et al. (1989) creatinine mean values were higher in the afternoon compared to morning and the diurnal trend was stronger in 25 healthy individuals.[8]

Our serum creatinine study is also in relation with Cordero N And Friedman MH, serum creatinine measurements rise during recumbency and drop when erect lordotic posture is assumed.[9]

It is of interest to note that a drop in the postural muscle activity causes drop in vascular tension in normal individuals thereby decreasing serum creatinine formation following drop in the glomerular filteration rate.[10]

Study by T Addis and colleagues are in relation to our findings that serum creatinine values decrease during rest hours or less muscle activity. Their study have inferred that there is a drop in serum creatinine during the period from 10 pm to 7 am and there was rise during the period from 7 am to 12 noon.[10]

The present study is mainly carried out to report the findings of diurnal variations in 02 major NPN serum levels to assess whether these changes are of sufficient magnitude to require wider recognition and possible adjustment when interpreting clinical laboratory results.

The effect of time of the day while estimating serum NPN levels is seen in CKD patients. One must consider diet, exercise, smoking, drug intake, and sleep as well. In the present study, the serum urea and creatinine levels showed non-significant diurnal variations in Chronic kidney disease patients.

CONCLUSION

In present study, we have not observed any significant variation in the case of serum urea and creatinine levels. Hence we suggest, to critically interpret serum urea and creatinine load specially in CKD patients, because such patients are already having compromised kidney and so they might not be able to excrete the extra level of creatinine released due to postural muscle activity during day hours.

It is also suggested that while interpreting NPN levels in patients, clinicians must take in account the time of the day at which the sample is collected alongwith other factors like age, sex, diet, exercise, height, muscle mass etc.

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