

Studies on serum creatinine level and its clearance in older adults as an index of renal function

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ABSTRACT

All organs and body structures are involved in the maintenance of homeostasis. In addition to the excretion of wastes, the kidneys play an especially vital role in regulating the volume and composition of body fluids. The role of the kidneys in the regulation of fluid and electrolyte balance is very significant and regulates the body's metabolic functions. Looking to the importance and the most significant role of this organ the investigations were carried out to evaluate serum creatinine level in the selected individual used as an index or a measure of renal function. Present study reports the distribution and correlates of serum Creatinine in a group of community-dwelling elderly individuals, aged 65 years and older. Study reveals that difference in the serum creatinine, plasma electrolytes levels and other hematological parameters values in the target group with respect of the healthy individuals.

Key words: Kidney, Serum creatinine, Renal function.

INTRODUCTION

Homeostatic balance is necessary for cells to perform their individual physiologic tasks. A steady delivery of nutrients viz., oxygen, glucose, fatty acids, and amino acids, the continuous removal of metabolic wastes like carbon dioxide and other end products of cellular metabolism, and the maintenance of a stable physiochemical environment are essential to homeostatic balance and thus to normal cellular function. Disruption of any of these three factors results in homeostatic imbalance with cellular dysfunction and illness. Kidneys play an especially vital role in regulating the volume and composition of body fluids.

The role of the kidneys in the regulation of fluid and electrolyte balance is very significant and regulates the body's metabolic functions. Ageing has been associated with numerous physiological changes followed by the structural and functional

alterations of the kidney that have been shown to occur with ageing process^{1-3, 6}.

Serum creatinine concentration is commonly used as a measure of renal function; the serum Creatinine level in healthy adults thus represents the balance between dietary Creatinine ingestion, Creatinine synthesis, and elimination of Creatinine through the kidney. In this connection an observational and experimental studies have been done which measured serum Creatinine for limited age ranges. Similarly some sample was also selected for excellent health status, which was taken as control group because they were the representative of the general population.

Present study will be helpful to provide some information on the distribution of measures of kidney function in a representative sample of the older population because the concentration of Creatinine in serum has long been the most widely

used and commonly accepted measure of renal function in clinical medicine ^{2,4-5}.

The water and electrolyte balance plays a central role in human body. Human body fluids contain various salts, which dissociate in the aqueous solution into charged particles (ions) and the dominant salt contained in the extra cellular fluid is dissolved sodium chloride approximately nine gram per liter.

MATERIAL AND METHODS

Present study has been under taken to describe the kidney patho-physiologic changes that occur during the aging process, which is associated with various physiological changes time to time. The work for the present study was carried out with an aim to evaluate the distribution and correlates of serum creatinine level in a group of community dwelling elderly individuals aged between 50 to older groups, who were enrolled under the present study. Approximate twenty two individuals were enrolled to initiate the work. Consent of the appropriate authority of the hospitals and research centers were obtained prior to initiate the study. Patient's assessment and case history was also recorded in this regard. Special emphasis was given to carry out the serum creatinine level estimation in older adult's patients and community dwelling individuals and to fulfill the objectives investigations were done as per the Standard clinical procedure throughout the study period.

RESULTS AND DISCUSSION

In the present study complete hematological investigations were made to evaluate

the individual's health status and decrease kidney functions. It was observed that the hemoglobin percentage was found to be in a very lower side i.e. 6.4 to 8.0 gm % in older adult's population specifically those who had some kidney problem. Their total WBC count was found increased (12,800 per cubic mm). In comparison of normal range and RBC counts were found significantly decreased (1.5 million / cu mm). Other differential counts were also found higher in side and well defined manner observed during the present microscopic study. Pus cells were also found during this phase. Chemical examination of the urine and in test report, it was shown acidic reaction with albumin traces. Bleeding time was found 1 minute 25 second and clotting time was recorded as 5 minutes 10 seconds (Table-1).

Table 1: Hematological Investigations

Parameters	Young Individuals	Older Adults
Hb (gm %)	10.4-12.0	6.4-8.0
TRBC (Per cu mm)	3.9-6.0	2.0-3.8
TWBC (Per cu mm)	4.8-9.9	14.0-29.0
Neutrophils (%)	59-75	72-74
Esinophils (%)	00-00	01-01
Basophiles (%)	00-00	00-00
Lymphocytes (%)	21-25	27-25
Monocytes (%)	00-00	00-00
PCV (%)	40-45	60-75
ESR(Wintrobe) mm first hour	2-10	9-20
Bleeding time	1 Min. 25 Seconds	1.10 Seconds
Clotting time	5 Min. 10 Seconds	5.20 Seconds

Table 2: Metabolic levels in general and selected groups

Parameters (mg/dl)	Range		Mean \pm SD	
	Young Individuals	Older Adults	Young Individuals	Older Adults
Blood urea	18.9-40.3	46.8-127.0	27.10 + 13.25	81.00+ 12.48
Serum creatinine	0.9-1.5	2.3-6.0	1.20+0.47	4.95+0.62

In the present study the blood urea was found to be ranged between 46.8 mg / dl to 127.0 / dl in older adults where as in the younger healthy individual the blood urea ranged found to be minimum 18.9 mg % and maximum 40.3 mg %. On the other hand serum Creatinine level in older individuals was with 0.9 to 1.5 mg % of serum Creatinine level, which shows the effect of age on the kidney profile in the blood. Biochemical examination in older adults as the value of blood urea level mg / dl in mean \pm SD were found 81.0 \pm 12.48 where as the blood urea level (mg / dl) in healthy individual was found with the mean \pm SD was found 27.10 \pm 13.25. Similarly, serum Creatinine level in older individual found with 4.95

mg / dl \pm 0.62 which show a significant difference in the plasma metabolites i.e. serum Creatinine with the adult healthy individual who had a Creatinine level (mg / dl) 1.20 \pm 13.25 (Table-2).

During the present study, compares the plasma electrolytes levels reveals that there was significant difference in both of the targets groups evaluated during the study period. There were the levels of sodium in older adults found to be 122 m mol / l to 160 m mol / l and the mean \pm standard deviation was 159.40 \pm 4.47 and the potassium level in older adults was found to be ranged between 4.7 m mol / l to 6.0 m mol / l and the mean \pm SD was 6.00 \pm 1.55. On the other hand the healthy individual

Table 3: Plasma electrolytes levels in general and selected groups

Parameters (mg/dl)	Range		Mean \pm SD	
	Young Individuals	Older Adults	Young Individuals	Older Adults
Sodium	130-150	122-160	145.90 + 8.48	159.40+ 4.47
Potassium	3.8-4.8	4.7-6.0	4.95+0.62	6.00+1.55

Table 4: Trace Elements level in general and selected groups

Groups	Trace Metals Concentration (ppm)	
	Copper	Zinc
Young Individuals	0.631	0.0132
Older Adults	0.865	0.0281

had a range of sodium and potassium 138.0 m mol / l to 150 m mol / l (Na) and 3.88 m mol / l to 4.8 m mol / l (K), 0.865 ppm and 0.659 ppm copper and zinc respectively. The concentration of copper and zinc in older adults was found as 0.631 ppm and 0.0281 ppm respectively, and showing the low level of trace essential elements in the older adults and which has been assumed as an essential element for the human body (Table,3-4).

Sodium Potassium copper and zinc are essential elements and electrolytes for the body of

normal human being and also for the proper body function but too much level of sodium can be harmful for the people with kidney disease because it can not eliminate excess sodium and fluid from the body. As sodium and fluid buildup in the tissue and blood stream and that's why the blood pressure increases. Similarly potassium is the major ion within the cells and very important for maintaining the electric charge on the cell membrane. Small changes in the potassium concentration outside cells can have substantial effects on the activity of nerves and muscles.

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