

Original Research Article

Study on Serum Creatinine Level among the Ethnic Assamese Population of Jorhat, Golaghat and Sivsagar Districts of Upper Assam - A Hospital Based Study

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ABSTRACT

Laboratory tests are meant to identify disease states and by using reference intervals these tests are interpreted. A cross sectional observational study involving 1036 healthy individuals was undertaken at Jorhat Medical College, Assam for establishing a region and laboratory based reference range of serum creatinine. Serum creatinine level was measured by Vitros slide method in Vitros 250 dry chemistry autoanalyzer, maintaining laboratory quality control. Results of the tests showed statistically significant ($p < 0.001$) difference in mean value in male and female population in the age groups of 20-30yrs and 31-40yrs. The range among male population was 0.5-1.1(mg/dl) and 0.5-0.9 (mg/dl) among female in 20-30 yrs group. In the 31-40 yrs group the range was 0.5-1.2 (mg/dl) in male and 0.5-1.1 (mg/dl) in female. The mean value showed an increasing value in 31-40 yrs age group than the younger 19-30 yrs. The range was 0.5-1.2 mg/dL of the total population with mean value 0.698 ± 0.189 (mg/dl). These results were comparable with studies done nationally and internationally, and it was found to be lower than the other studies. Establishing reference range in our study population is of utmost interest and future studies involving larger population are highly advocated.

Keywords: *reference interval, creatinine, Assamese.*

INTRODUCTION

Creatinine is the cyclic anhydride of creatine that is produced as the final product of decomposition of phosphocreatine. Creatine is synthesized in kidneys, liver and pancreas by two enzymatically mediated reactions. Creatine is then transported in blood to other organs, such as muscle and brain, where it is phosphorylated to phosphocreatine, a high energy compound. Interconversion of phosphocreatine and creatine is particular feature of metabolic processes of muscle contraction. A proportion of the free creatine in muscle spontaneously and irreversibly converts to its anhydride waste product creatinine. Thus

the amount of creatinine produced each day is fairly constant and is related to the muscle mass. In health, the concentration of creatinine in the bloodstream is fairly constant, although diet may influence the value, depending on the individuals' meat intake. Creatinine is present in all body fluids and secretions and is freely filtered by the glomerulus. It is not reabsorbed to any great extent by the renal tubules; there is a small but significant tubular secretion. Creatinine production also decreases as the circulating level of creatinine increases, several mechanisms for this have been proposed, including feedback inhibition of production of creatine, reconversion of

creatinine to creatine, and conversion to other metabolites. [1]

The approach in developing reference values has been regarded as an important step towards clinical interpretation of laboratory data. [2] History, clinical signs of patient, disease incidence and the laboratory data must be weighed together by the clinician to forward in patient management. [3] Most of the medical laboratories used to quote “normal ranges” not so related, but ideally test results of the biochemical parameters should be referred to as a population whose status is defined. [4] The reference range of a particular parameter is defined as the concentration of that parameter in a group of clinically healthy persons [5] in healthy individuals they vary considerably in different populations. [6] Several factors such as age, sex, dietary habits of the people, genetics, ethnicity, geographical location, and climate influence the normal laboratory values. [7-12] Drugs or vaccines administered for therapeutic purposes or clinical trials also lead to significant variations; while some parameters show diurnal and seasonal variations. [13] Different laboratory set up mainly the techniques and principles also changes the values. [14,15] Pathological conditions that affect major body organs and systems that produce, secrete, or store these parameters lead to variation in the normal values. [16,17]

Jorhat Medical College and Hospital (JMCH) caters health services to the upper Assam Districts of Sivsagar, Golaghat and Jorhat District. There is no published data regarding normal reference range of serum creatinine of the population living in this part of Assam till date. Our study is an attempt to work in this unexplored field.

MATERIALS AND METHODS

Aims and Objective:

- To estimate reference interval for serum Creatinine in ethnic Assamese individuals attending Jorhat Medical College Hospital

- To compare the reference interval established in our reference population with other published data

Design of the study:

Study design: cross-sectional observational Study.

Subjects: Subjects were selected for the study from the population attending Jorhat Medical College Hospital. The consent form was provided to the subject to obtain prior approval before their inclusion in the study. They were selected based on the Inclusion / exclusion criteria that had been adopted for the study.

Period of recruitment: July 2015 to May 2016

Inclusion criteria

- Age: 18 years and above.
- Either sex
- Individuals with history of normal blood pressure (120/80 mm Hg), chest x-ray and ECG
- Ethnic Assamese of Jorhat, Golaghat and Sivsagar of upper Assam living in this region for more than 6 months

Exclusion criteria

- Diabetes mellitus
- Pregnancies
- Liver dysfunction
- Strenuous exercise
- Hypertension or other cardiovascular abnormalities
- Alcohol consumption
- Tuberculosis
- Smoking
- Acute inflammatory conditions

A brief history of the patient is collected and demographic details such as age, sex, height, weight, history of alcohol consumption, smoking, chewing tobacco, details on lifestyle/occupation is recorded.

Laboratory test

Specimen

Venous blood sample was collected in red top vacutainers (with clot activators) by venipuncture adopting universal precautions.

Samples were made to stand for 20 minutes at room temperature and then centrifuged for 5 to 10 minutes at 3200 rpm. Serum was separated into secondary sample cup and then analysed for serum creatinine. All grossly hemolyzed, Lipaemic and turbid samples were discarded.

Laboratory parameter

Biochemical parameter i.e. serum creatinine was analysed in fully automated dry chemistry analyzer: Vitros 250.

Method

The vitros creatinine slide method using Vitros Creatinine slides and the Vitros Chemistry Products Calibrator Kit 1 on Vitros chemistry systems.

Quality control

Laboratory Quality control was maintained during the period of biochemical analysis for the study undertaken.

Statistical Methods

The data were analysed using Microsoft Excel. The data were partitioned by gender and age. Statistical significance of the study was tested by Z test using online calculator.

RESULTS

In the present study, total of 1036 subjects were selected for estimation of serum creatinine level. Out of the total, 565 male and 471 female subjects were included in the study.

Table 1: Serum creatinine levels observed in the healthy normal subjects of different age group

Age group in years (n=no of subjects)	Total range (mg/dl)	Mean (mg/dl)	Standard Deviation
20-30 (n=700)	0.5-1.1	0.662	0.163
31-40 (n=336)	0.5-1.2	0.774	0.214
Total (n=1036)	0.5-1.2	0.698	0.189

Age wise distribution of the population in 20-30 yrs and 31-40 yrs, showed higher mean value i.e. 0.774 ± 0.214 (mg/dl) in the older age group than the younger one. The mean value was found to be 0.662 ± 0.163 (mg/dl) in the younger age group (20-30 yrs). Thus it showed increasing value of serum creatinine with increase in age. The lower and upper limit were 0.5-1.1 (mg/dl) and 0.5-1.2 (mg/dl) in the 20-30 yrs and 30-40 yrs age group respectively. The total population of 1036 revealed mean value of 0.698 ± 0.189 (mg/dl). The range of upper and lower limit of the total population was found to be 0.5-1.2 (mg/dl).

Table 2: Serum creatinine (mg/dl) concentration showing the mean value ranges and sample size in males and females of different age group

Age group	Male	Female	P value
20-30 yrs	0.750 ± 0.171 0.5-1.1 n= 370	0.562 ± 0.700 0.5-0.9 n=330	<0.001
31-40 yrs	0.801 ± 0.219 0.5-1.2 n=195	0.740 ± 0.204 0.5-1.1 n=141	<0.001

For our study we divided the subjects in two age groups i.e. 20-30 yrs and 31-40 yrs accordingly in male and female categories.

In the age group of 20-30 yrs 370 male and 330 female subjects were selected whereas 195 male and 141 female was the sample size in 31-40 yrs age group.

370 male subjects (in 20-30 yrs gr) had mean value of 0.750 ± 0.171 (mg/dl) and minimum and maximum range of 0.5-1.1 (mg/dl); while among the Female subjects of 330 in the same age group, the mean and Minimum to Maximum range was found to be 0.562 ± 0.700 (mg/dl), and 0.5-0.9 (mg/dl) respectively. Male population had higher mean value than the female and the upper range limit was less in female by 0.2mg/dl.

In the age group of 31-40 yrs, 195 male subjects showed mean value of 0.801 ± 0.219 (mg/dl) and range of 0.5-1.2(mg/dl). The mean value and range shown by the 141 female subjects in the same age category was 0.740 ± 0.204 (mg/dl) and 0.5-1.1 (mg/dl) respectively. Similar to the above age (20-30 yrs) group, higher mean value and higher upper limit by 0.1mg/dl were observed in the male subjects.

DISCUSSION

Ashavaid T F et al ^[18] had conducted a study to establish reference interval on population attending the Health Plan Programme in the Hinduja National Hospital & Medical Research Centre, Veer Savarkar Marg, Mahim, Mumbai. In this study, 4466 subjects were analysed. Reference interval for Serum creatinine was 0.7 to 1.30 mg/dl (male) and 0.6 to 1.0mg/dl (female.) The methodology used for establishing the reference intervals was based on standard IFCC methods on Synchrom CX7 and Coulter Counter from Beckman Coulters. Our observed reference range although falls within the reference range of this study; however both the upper and lower ranges are less in our study.

Sundaram M et al ^[19] conducted a study on 213 subjects on apparently healthy individuals attending a HIV referral center in Chennai. According to this study, serum creatinine reference interval was 0.9 to 1.3 mg/dl (male) and 0.7 to 1.0 mg/dl (female). The methodology used for establishing the reference interval was based on Olympus Diagnostica GmbH, Ireland. Our studied reference range is comparable with this study. From our observation, in case of male the reference range of 0.5-1.2 is less than the 0.9-1.3 of the population of Chennai studied. In case of Females, of our study, the upper limit is 0.1 units more, but the lower limit is less by 0.2 units.

Verma M and co-workers ^[20] conducted study of 1121 subjects to establish reference interval at SRL Ranbaxy Clinical Reference Laboratory, Mumbai. According to this study the reference ranges were 0.7-1.3 and 0.4-1.0 mg/dl for males and females respectively. This study is also comparable with ours. Our female reference range is 0.5-1.1mg/dl.

There is variation in serum creatinine levels in our study from study by Yadav AS et al and our reference levels was found to be lower than the established ranges of 0.6-1.5mg/dl by Western Literature of Harper. ^[21]

CONCLUSION

Our study population showed a lower value of both maximum and minimum levels of serum creatinine than the studies of Western population and there was variation in the range from other Indian Studies too. It may be because of less muscle mass, weight and height in the population of this region. Different Laboratory methodology is a cause to the variation. Genetic and Geographical variation is also a factor to this difference. Hence, a further elaborated study to establish the reference limits of serum creatinine in each individual laboratory of this region for Ethnic Assamese population is advocated.

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