

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

# Reference values for serum creatinine concentrations with Jaffe-compensated assay in Iranian adult subjects

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# Introduction

Chronic kidney disease is a worldwide public health problem with increasing prevalence and incidence

Glomerular filtration rate (GFR), the best overall index of renal function, is mostly estimated from serum creatinine concentration

Any equation using serum creatinine level for estimating GFR is dependent on the serum creatinine assay

*Levey AS: Ann Intern Med 139:137-147, 2003----- Hosseinpanah F: BMC Public Health 9:44, 2009*

*Levey AS: Ann Intern Med 130:461-470, 1999----- Selvin E: Am J Kidney Dis 50:918-926, 2007*

*Coresh J: Am J Kidney Dis 39:920-929, 2002----- Hetu PO: Clin Biochem 43:1158-1162, 2010*

*Kuster N: Clin Biochem 45:320-325, 2012-----*

# Introduction

Serum creatinine concentration is affected by factors other than creatinine filtration

including:

- Sex
- Age
- Race
- Diet
- Muscle mass
- Analytical method

*Levey AS: Ann Intern Med 130:461-470, 1999*

*Cerioni F: Clin Chem 54:559-566, 2008*

*Myers GL: Clin Chem 52:5-18, 2006*

# Introduction

Jaffe method, used in most routine laboratories, has a low specificity and overestimates serum creatinine by approximately 20-30% at physiological values, because of noncreatinine chromogens (mainly proteins)

Enzymatic creatinine methods are more specific and have been widely adopted for routine clinical laboratory as alternatives to the alkaline picrate methods

*Coresh J: Am J Kidney Dis 39:920-929, 2002*

*Chromy V: Clin Chem Lab Med 46:1127-1133, 2008*

*Junge W: Clin Chim Acta 344:137-148, 2004*

# Introduction

For serum creatinine, like other naturally occurring biochemical compounds, a reference interval needs to be provided

Reports of reference intervals for serum creatinine levels in Asian populations, considering IFCC (International Federation of Clinical Chemistry) criteria with accurate description of the measurement method, are scant

To our knowledge, there is no documented report on reference values of serum creatinine in Iran

*Ceriotti F: Clin Chem 54:559-566, 2008----- Jorgensen LG: Clin Chem Lab Med 42:817-823, 2004*

# Aim

To determine age- and sex-specific reference intervals for serum creatinine concentration using data from a population-based study from Iran

# Subjects and Methods

## Subjects

Participants of Tehran Lipid and Glucose Study (TLGS) from June 2008 to September 2011

## Number of subjects

5247 apparently healthy participants (2792 men and 2455 women), aged 20 to 88 years

Separate analysis was done for healthy menopausal women (n= 452; age range 51-84 years).



# Subjects and Methods

## Exclusion criteria

- Pregnancy
- Hypertension
- Diabetes
- History of cardiovascular disease, cancer, and diarrhea
- History of hospitalization during the past 3 months
- History of significant weight loss during past 6 months
- Using medications including steroids, diuretics, betablockers, digitals, calcium channel blockers, angiotensin converting enzyme inhibitors, aspirin and other anticoagulants, lipid lowering drugs, male or female hormones, contraceptives (oral or injection), or drugs for thyroid disorders

# Subjects and Methods

## *Creatinine measurement*

Serum creatinine was measured using the photometric Jaffe method (Pars Azmoon Kit, Tehran, Iran)

In 382 samples, creatinine measurement was done with both Jaffe and enzymatic p-aminophenazone (PAP) methods

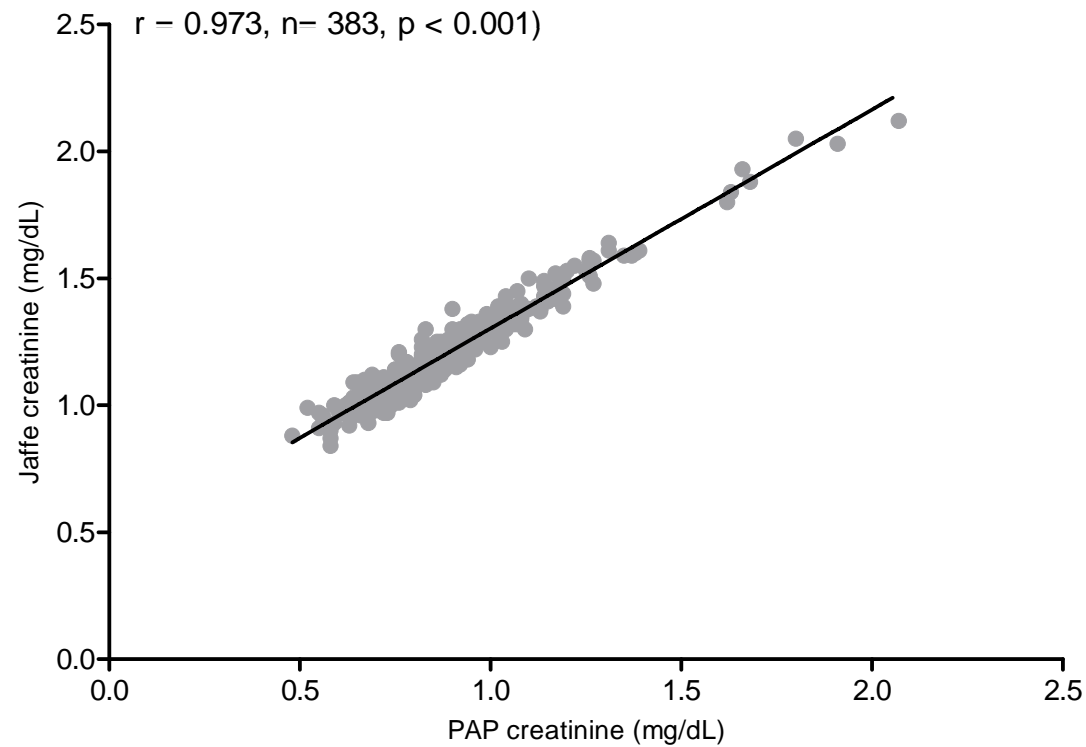
*Method for determining reference values:*

IFCC criteria (non-parametric method)

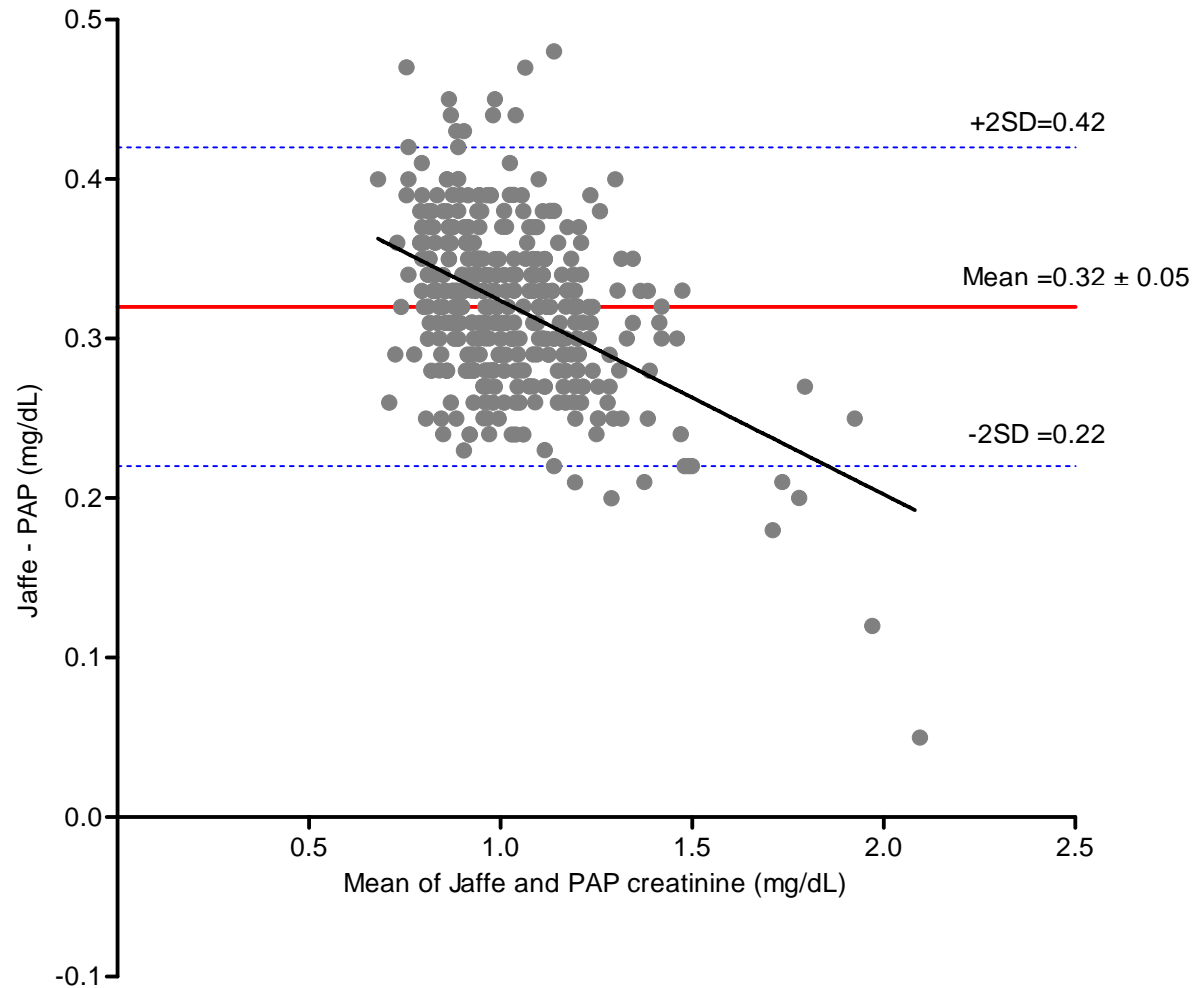
# Results

## Regression line between Cr measurement with Jaffe and PAP (enzymatic) methods

$$\text{Jaffe Cr} = 0.863 \times \text{PAP Cr} + 0.44 \text{ mg/dL}$$



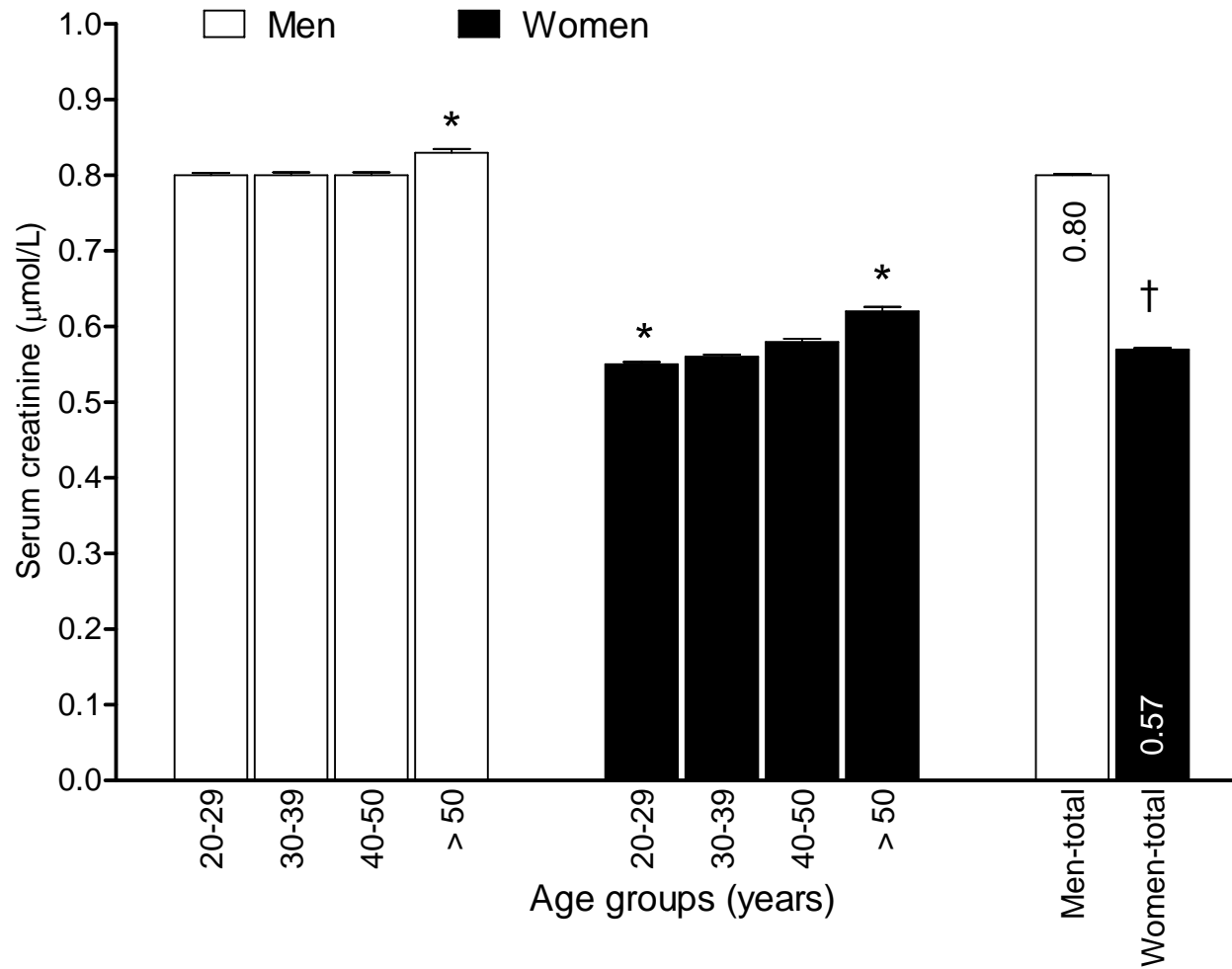
# Bland-Altman method comparison for comparing creatinine measurements by Jaffe and PAP methods



### Comparison of serum creatinine concentration according to sex and age

\*: significant difference with other groups

†: significant difference compared to men



Reference intervals for serum creatinine concentration (mg/dL) in healthy adult subjects according to age and sex using the compensated Jaffe method

	Age (years)	n	95% Reference intervals
Men			
	20-29	856	0.53-1.00
	30-39	633	0.53-1.00
	40-50	701	0.53-1.11
	>50	602	0.53-1.11
	All	2792	0.53-1.11
Women			
	20-29	972	0.31-0.77
	30-39	818	0.42-0.77
	40-50	665	0.42-0.77
	>50	452	0.42-0.88
	All	2455	0.42-0.77

# Discussion



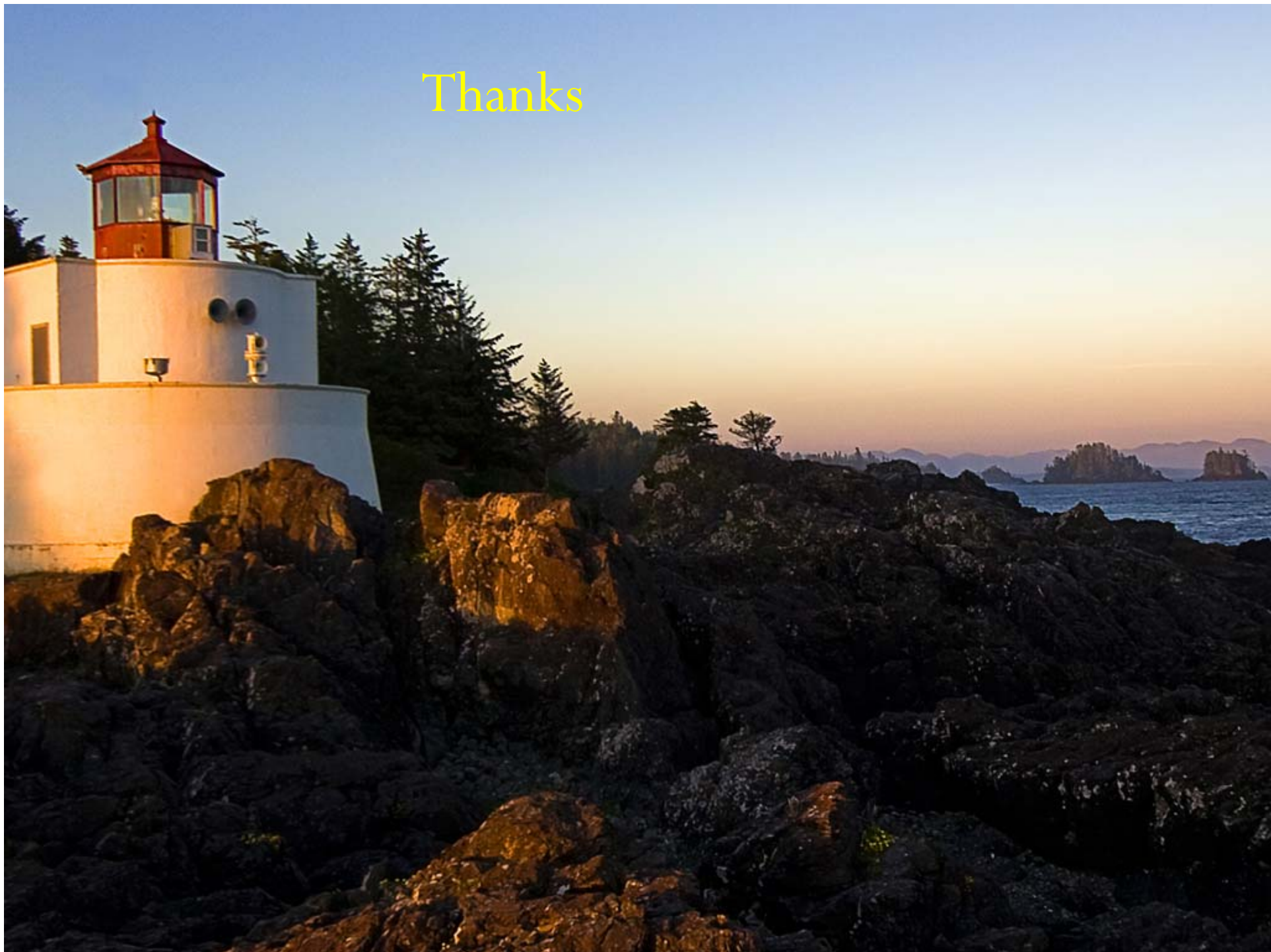
### Serum creatinine reference values (mg/dL) in selected countries

Country	year	Age (years)	Creatinine reference values (μmol/L)		Method
			Males	Females	
South Australia (Adelaide)	2000	18-70	0.70-1.20	0.50-0.91	Compensated Jaffe
Germany	2004	18-74	0.71-1.17	0.54-0.96	Compensated Jaffe
Nordic countries (Denmark, Finland, Iceland, Norway, and Sweden)	2004	≥18	0.70-1.20	0.63-1.00	Compensated Jaffe
India	2006	20-60	0.80-1.30	0.60-1.00	Enzymatic
Spain	2007	19-65	0.72-1.20	0.59-0.96	Compensated Jaffe
Belgium	2008	20-70	0.63-1.17	0.48-0.93	Enzymatic
Italy	2010	18-79	0.65-1.17	0.45-1.00	Compensated Jaffe
China	2011	20-91	0.66-1.11	0.49-0.79	Enzymatic
Kenya	2012	18-50	0.63-1.12	0.54-0.96	ND
Iran	Present	20-88	0.53-1.11	0.42-0.77	Compensated

# Conclusion

1. Reference intervals for serum creatinine concentration according to compensated Jaffe method, derived from a population-based study in Iran, are 0.53-1.11 and 0.42-0.77 mg/dL in men and women respectively
2. Upper limits of serum creatinine reference values are lower than European countries and are close to the China and Kenya
3. These values could be used for research, diagnostic and therapeutic purposes

Thanks



Intra-assay CVs were 2.2% and 3.1% for Jaffe and PAP method respectively (n=72).

Inter-assay CVs for normal creatinine concentration were 4.1% and 6.1% for Jaffe and PAP method respectively and for high creatinine concentration were 1.3% and 1.7% for Jaffe and PAP method respectively (n=17).