Evaluation of CKD-EPI Pakistan Equation for estimated Glomerular Filtration Rate (eGFR) in Pakistan

Sibtain Ahmed, Lena Jafri and Aysha Habib Khan
Section of Clinical Chemistry
Department of Pathology & Laboratory Medicine
The Aga Khan University, Karachi Pakistan

XXVII Balkan Clinical Laboratory Federation Meeting BCLF 2019
XXX National Congress of the Turkish Biochemical Society TBS 2019

Background:
Chronic Kidney Disease (CKD)

* Caucasians – 11to 12%
* Survey in Karachi in 2006 (n=1177, cluster sampling from four randomly selected communities) - 11.8%
* Community cohort study in urban Karachi - 16.6% (2014)
* Population based cross sectional study in Karachi on 262 individuals above 40 years, 29.9 % had reduced GFR (2005)
* Exact prevalence unknown

Study Rationale: Measuring Renal Function

* Serum Creatinine (Cr) most common
* Serum Cr misses 20%
* Glomerular Filtration Rate (GFR) using 24 hour urinary creatinine clearance (CrCl)
* Modification of Diet in Renal Disease (MDRD)
* Cockcroft Gault (CG)
* Chronic Kidney Disease Epidemiology Collaboration formula (CKD-EPI)
* CKD-EPI Pakistan equation (CKD-EPI Pak)

(Jafar TH et al. Am J Kidney Dis. 2014 Jan; 63(1):49-58)

Objective:

* To compare CKD-EPI, CKD-EPI Pak, CG and MDRD formulae with CrCl calculated through a timed urine collection

Materials and Method:

* Cross sectional
* Collected data of subjects requesting CrCl : 6 months
* Section of Clinical Chemistry, AKU Karachi
* Inclusion criteria: ≥18 ≤ 70 years of age
* Exclusion criteria: Subjects without height and weight

Statistical Software:

* SPSS version 22.0
* Analyze-it for MS-Excel

Statistical tools:

* Regression: correlation, slope, y-intercept
* Concordance
* Bland Altman Plot

Materials and Method cont: Models for Estimating GFR in adults

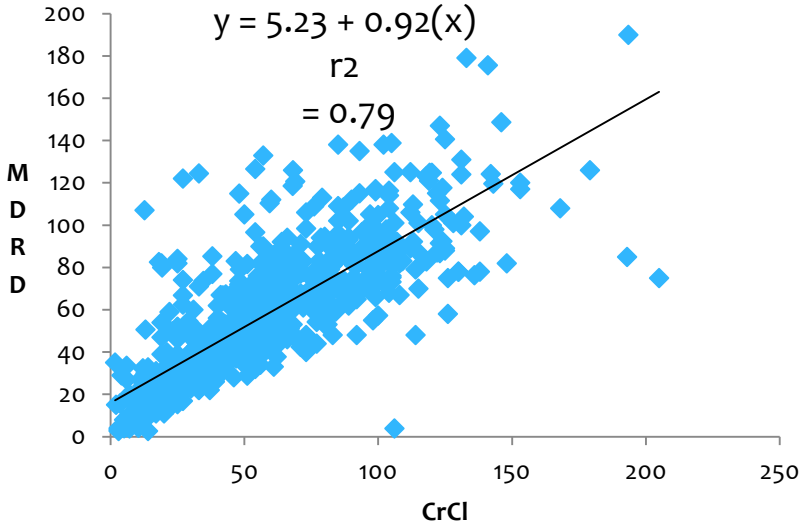
Method of GFR calculation	Formulae
CKD-EPI (ml/min per 1.73 m^2)	If SCr < 0.9 (for male): $141 \times (SCr/0.9)^{-0.411} \times 0.993^{Age}$ If SCr > 0.9 (for male): $141 \times (SCr/0.9)^{-1.209} \times 0.993^{Age}$ If SCr < 0.7 (for female): $144 \times (SCr/0.7)^{-0.329} \times 0.993^{Age}$ If SCr > 0.7 (for female): $144 \times (SCr/0:9)^{-1.209} \times 0.993^{Age}$
CKD-EPI Pak (ml/min per 1.73 m^2)	$0.686 \times \text{CKD-EPI}^{1.059}$

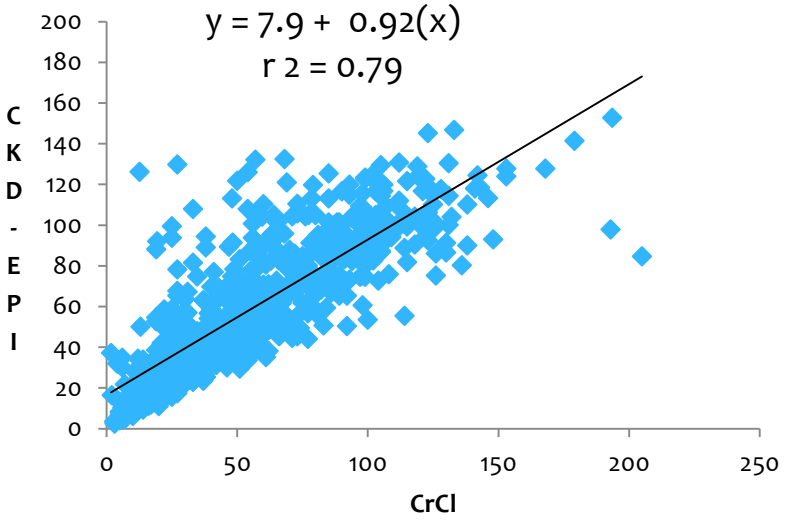
Results:
n=670

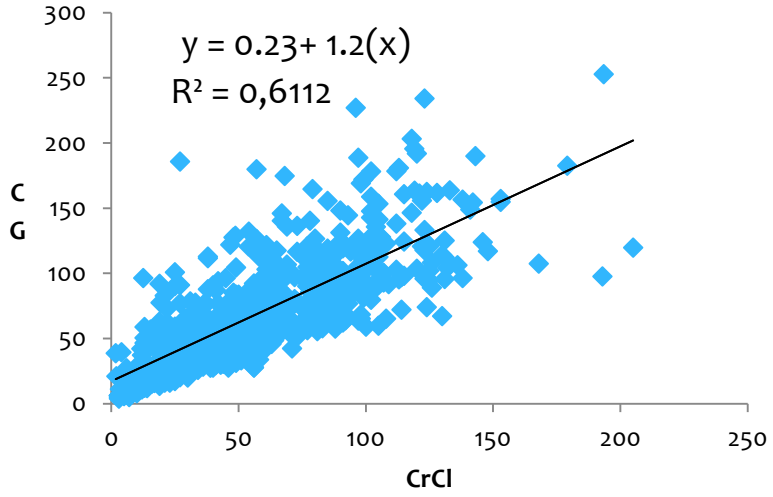
Characteristics	Males n=373 55.7%	Females n=297 44.3%
Age* in years	51.5 (±16)	51 (±14.5)
BMI* in kg/m^2	27.8 (±13)	27.6 (±5.8)
Median Cr (Range) in mg/dL	1.4 (0.4-20.2)	1.0 (0.4-13)
CrCl < 60 (mL/min per 1.73 m^2)	20%	35.3%

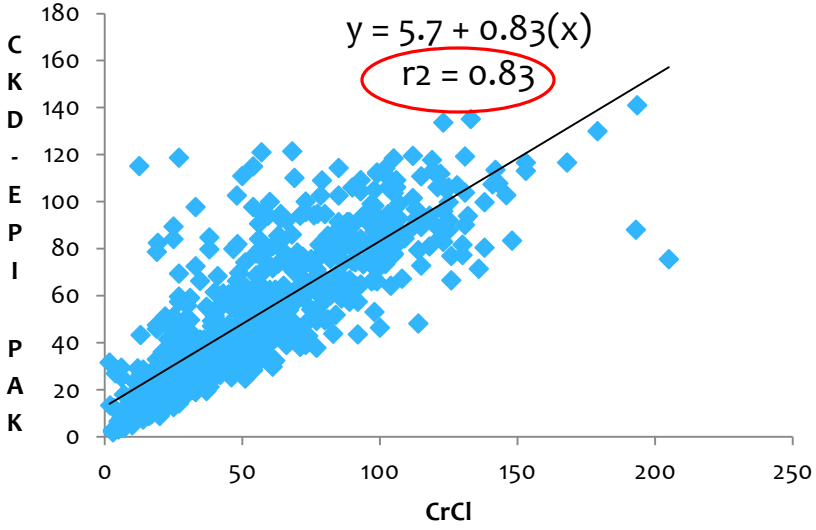
* Expressed as mean (±SD)

Deming Regression Analysis

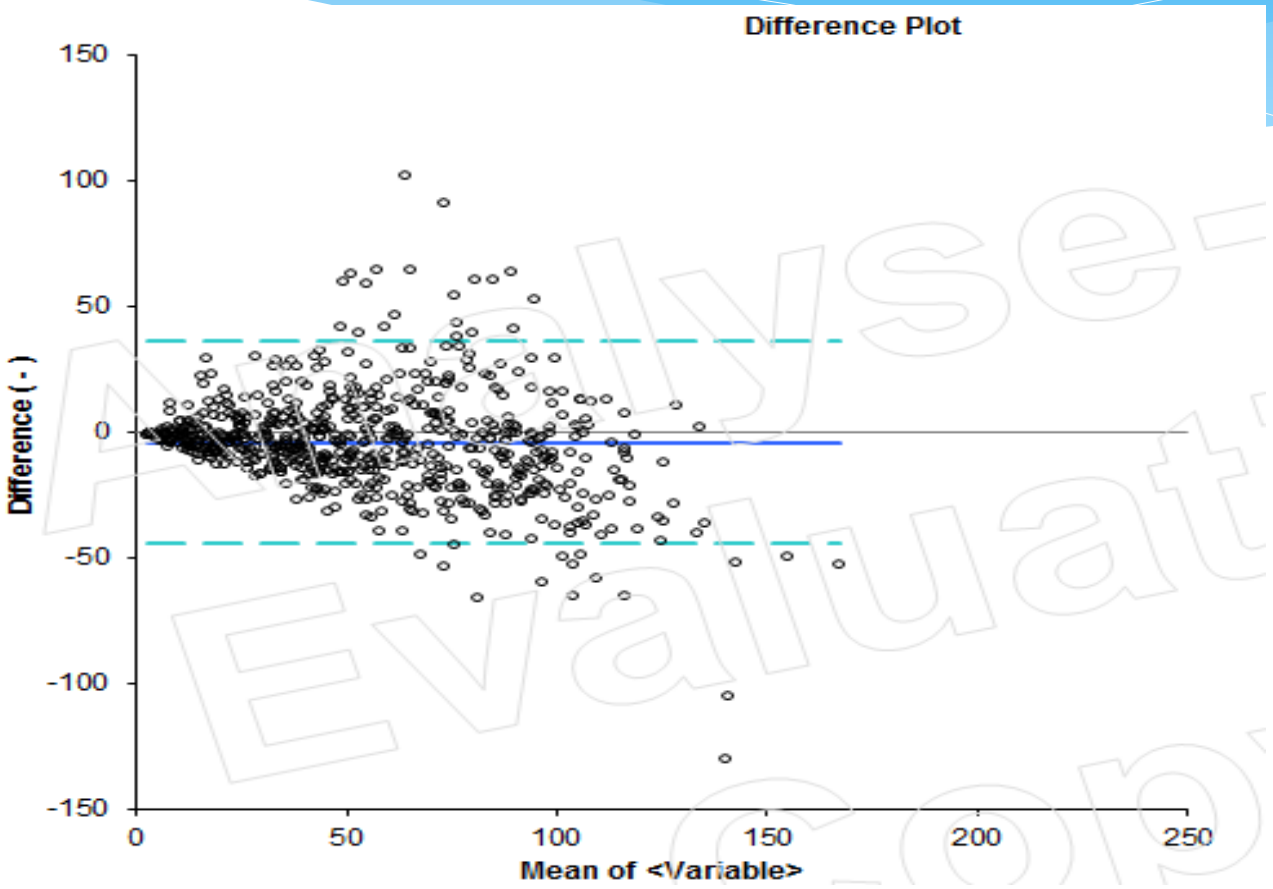








Bland Altman Plot
(CKD-EPI Pak and CrCl)



Diagnostic Ability* of CKD-EPI Pak, MDRD, CG and CKD-EPI versus CrCl

	MDRD	CG	CKD-EPI	CKD-EPI Pak
Sensitivity	87.2%	76.6%	81.8%	88.7%
Specificity	83.2%	89.8%	86.1%	79%
Positive predictive value	87.8%	91.5%	89%	85.4%
Negative predictive value	79%	72.9%	77.3%	83.4%

* Calculated for a threshold cut-off of 60 ml/min/1.73 m^2 taking CrCl as the reference

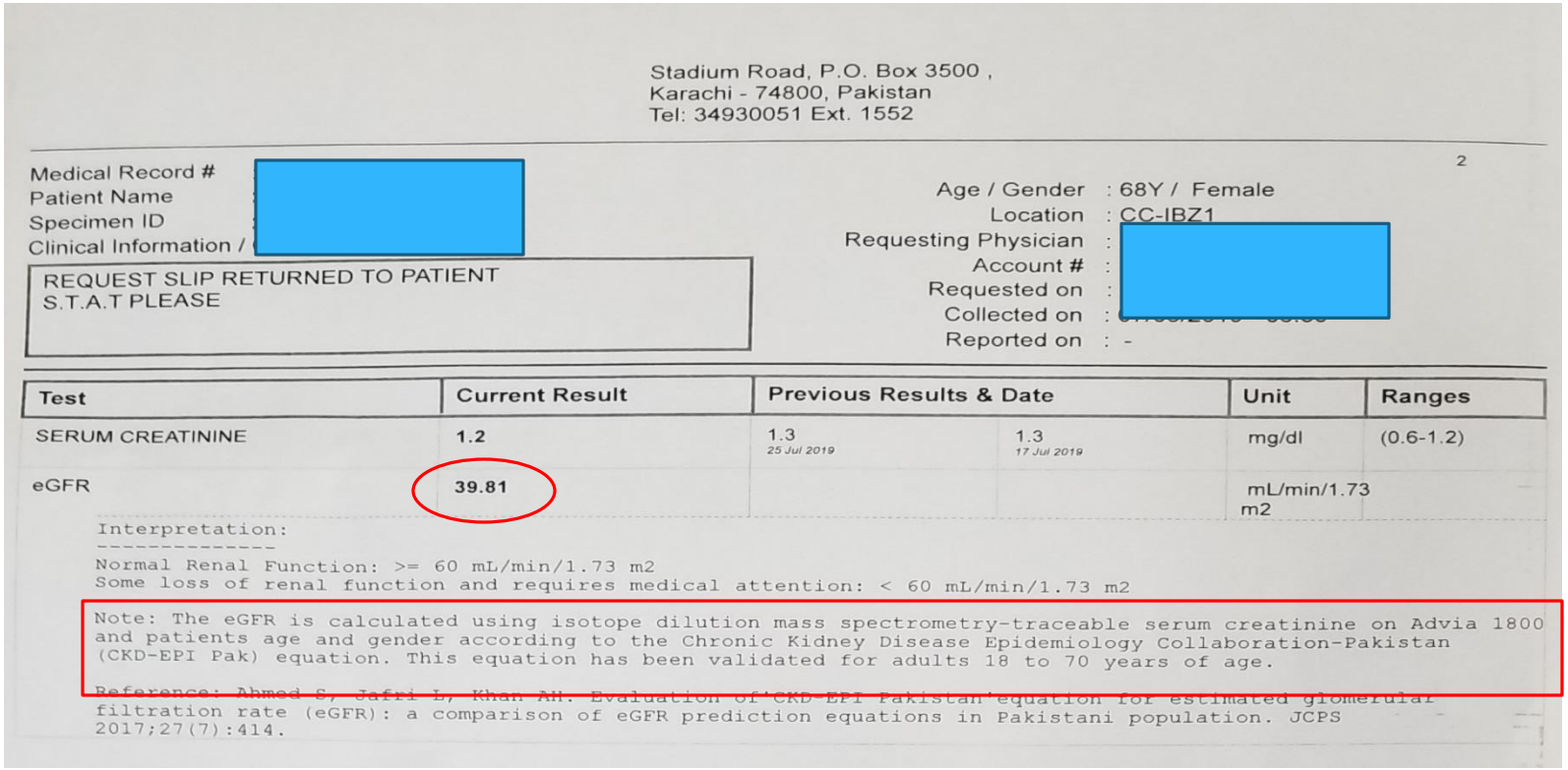
Agreement & concordance of CrCl versus eGFR formulae

eGFR formulae	CrCl		
	Agreement (n)	**Disagreement (n)**	**Concordance (%)**
MDRD	562	108	83.9%
CG	553	117	82.5%
CKD-EPI	560	110	83.5%
CKD-EPI Pak	567	103	84.7%

Conclusion

* Automatic reporting of eGFR using CKD-EPI Pak equation initiated
* Equations outperformed serum Cr
* Cost effective
* Feasible

A sample report from our lab



Stadium Road, P.O. Box 3500 ,
Karachi - 74800, Pakistan
Tel: 34930051 Ext. 1552

2

Medical Record # :
Patient Name :
Specimen ID :
Clinical Information / :

REQUEST SLIP RETURNED TO PATIENT
S.T.A.T PLEASE

Age / Gender : 68Y / Female
Location : CC-IBZ1
Requesting Physician :
Account # :
Requested on :
Collected on :
Reported on : -

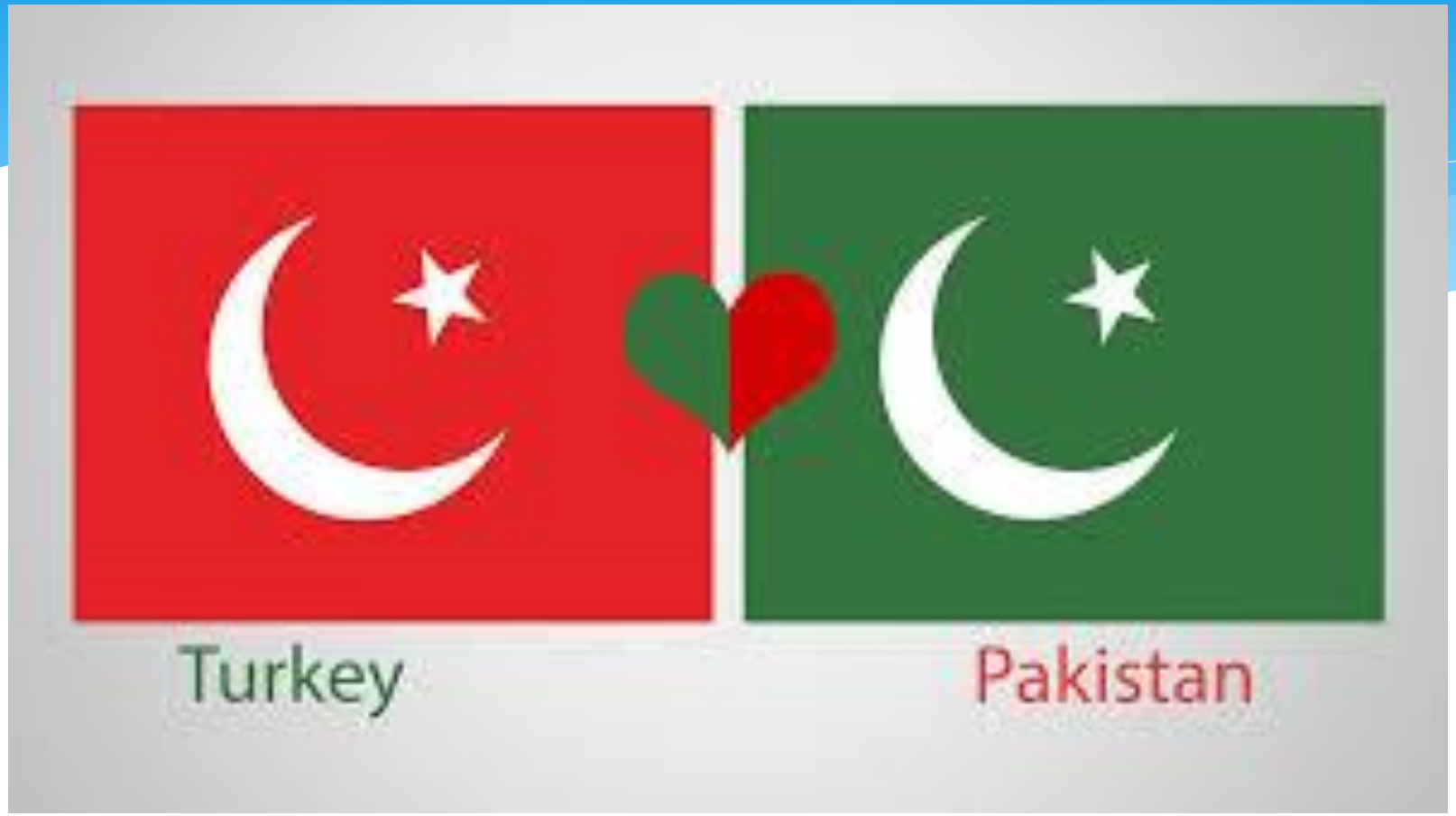
Test	Current Result	Previous Results & Date		Unit	Ranges
SERUM CREATININE	1.2	1.3 25 Jul 2019	1.3 17 Jul 2019	mg/dl	(0.6-1.2)
eGFR	39.81			mL/min/1.73 m2	

Interpretation:

Normal Renal Function: >= 60 mL/min/1.73 m2
Some loss of renal function and requires medical attention: < 60 mL/min/1.73 m2

Note: The eGFR is calculated using isotope dilution mass spectrometry-traceable serum creatinine on Advia 1800 and patients age and gender according to the Chronic Kidney Disease Epidemiology Collaboration-Pakistan (CKD-EPI Pak) equation. This equation has been validated for adults 18 to 70 years of age.

Reference: Ahmed S, Jafri L, Khan AH. Evaluation of CKD-EPI Pakistan equation for estimated glomerular filtration rate (eGFR): a comparison of eGFR prediction equations in Pakistani population. JCPS 2017;27(7):414.



teşekkür ederim