

Measurement of eGFR in pregnancy: Serum Creatinine-Based Alternative to 24-Hr-Urine Creatinine Clearance

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Objective

- **Estimated glomerular filtration rate (eGFR): Key indicator of kidney function**
- Abnormal midterm eGFR associated with adverse pregnancy outcomes
- Gold standard for measurement of eGFR: 24-hr urine creatinine clearance but collection of 24-hr urine cumbersome & inconvenient
- **We compared diagnostic accuracy of serum creatinine based eGFR estimation methods (CKD-EPI, MDRD, NANRA) with the gold standard in pregnant women**

Design

- Diagnostic study to assess diagnostic accuracy of all methods to measure eGFR

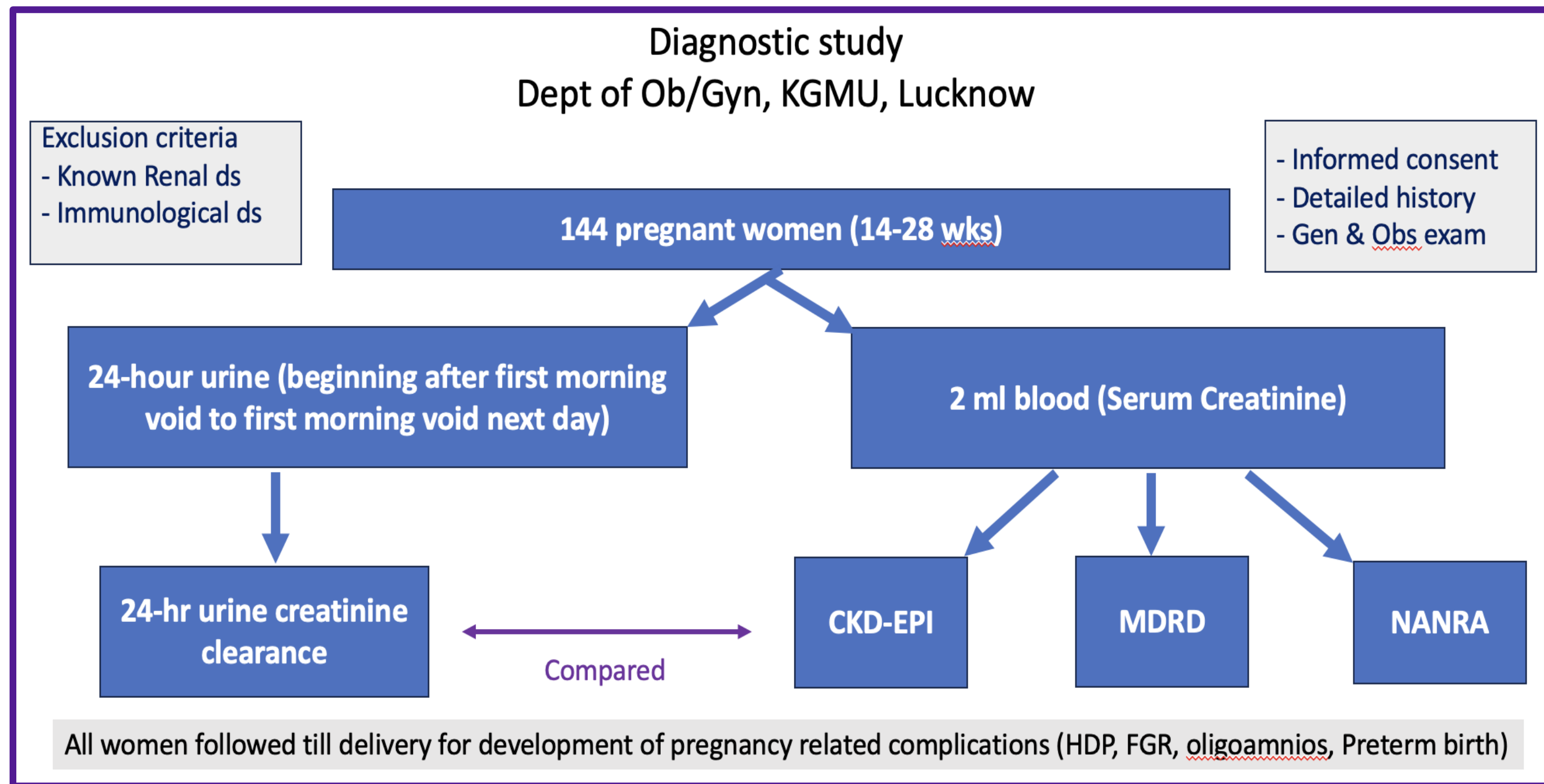
Conclusion

- Measurement of midterm eGFR in pregnancy allows **early identification of renal dysfunction** in pregnancy & can predict serious pregnancy related complications
- **CKD-EPI** is a feasible, convenient, relatively accurate alternative to 24-hr-urine creatinine clearance for measuring eGFR in pregnancy which can be **easily integrated in routine obstetric care**
- It is also a **promising biomarker** to predict pregnancy outcome and risk of long term renal dysfunction

Reference

- Gao M, Vilayur E, Ferreira D, Nanra R, Hawkins J. Estimating the glomerular filtration rate in pregnancy: The evaluation of the Nanra and CKD-EPI serum creatinine-based equations. *Obstetric Medicine*. 2020 Mar 19;14(1):31–4.
- Alper AB, Yi Y, Rahman M, Webber LS, Magee L, von Dadelszen P, et al. Performance of estimated glomerular filtration rate prediction equations in preeclamptic patients. *American Journal of Perinatology* [Internet]. 2011 Jun 1 [cited 2024 Apr 29];28(6):425–30.
- Park S, Lee SM, Park JS, Hong JS, Chin HJ, Na KY, et al. Midterm eGFR and Adverse Pregnancy Outcomes: The Clinical Significance of Gestational Hyperfiltration. *Clinical Journal of the American Society of Nephrology*. 2017 Jun 13;12(7):1048–56.

Method



Formulae for calculation of eGFR

CKD-EPI	• Chronic Kidney disease Epidemiology Collaboration formula • $141 \times \min(\text{Scr}/\kappa, 1) \alpha \times \max(\text{Scr}/\kappa, 1) - 1.209 \times 0.993 \text{ Age} \times 1.018 [\text{if female}] \times 1.159 [\text{if black}]$
MDRD	• Modification of Diet in Renal Disease • $175 \times \text{Serum Cr} - 1.154 \times \text{age} - 0.203 \times 1.212 (\text{if patient is black}) \times 0.742 (\text{if female})$
NANRA	• Equation named after its creator • $(140 - \text{age}) \times (\text{height})^2 \times (0.02588 / \text{serum creatinine})$

Results

Fig 1: Mean eGFR (mL/min/1.73m²) with different methods of eGFR estimation

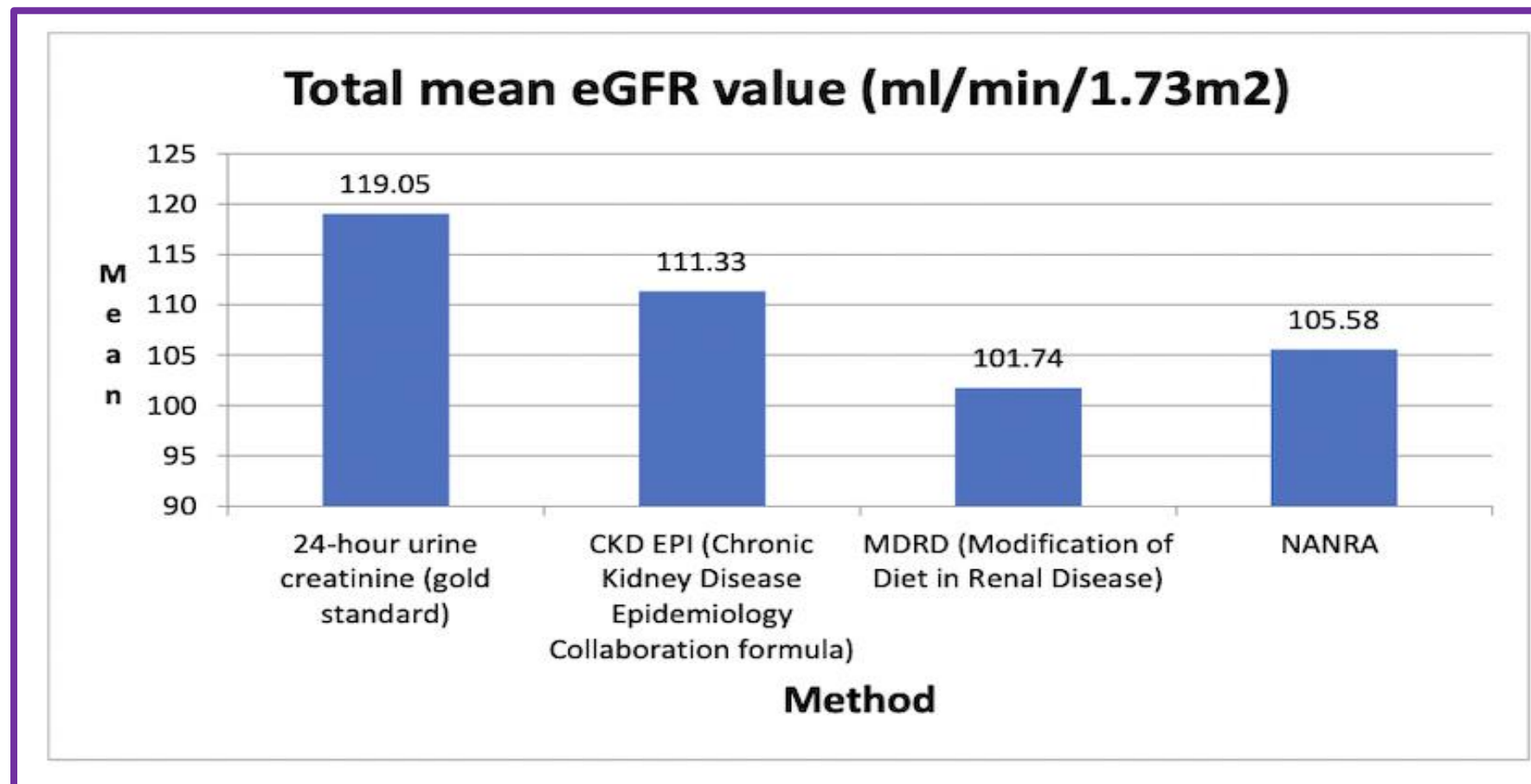


Fig 3: Classification of pregnant women in subgroups according to eGFR by Gold standard test

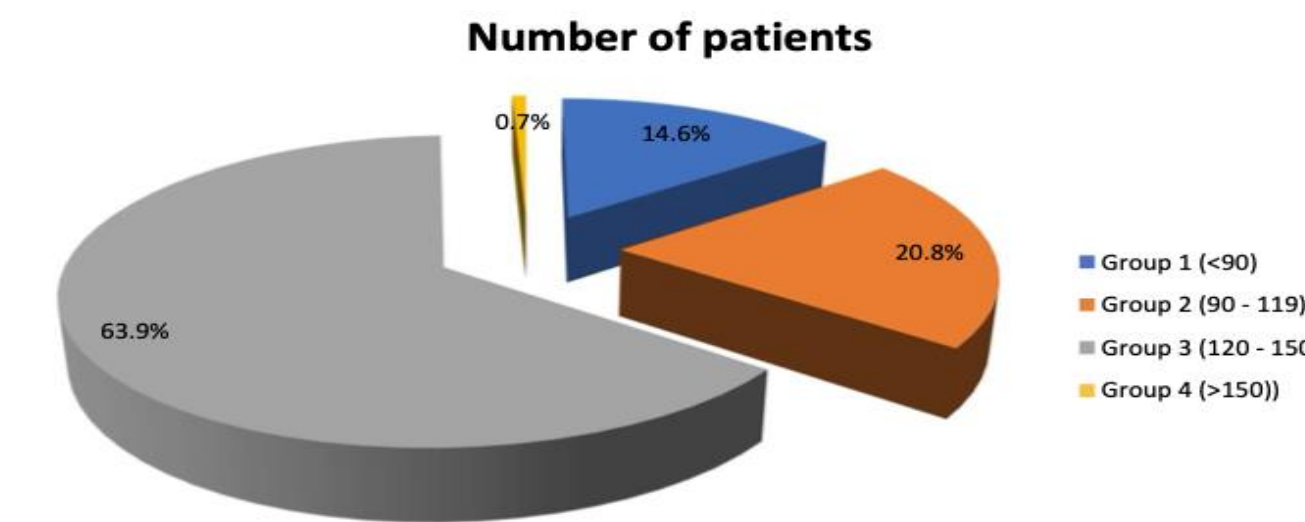
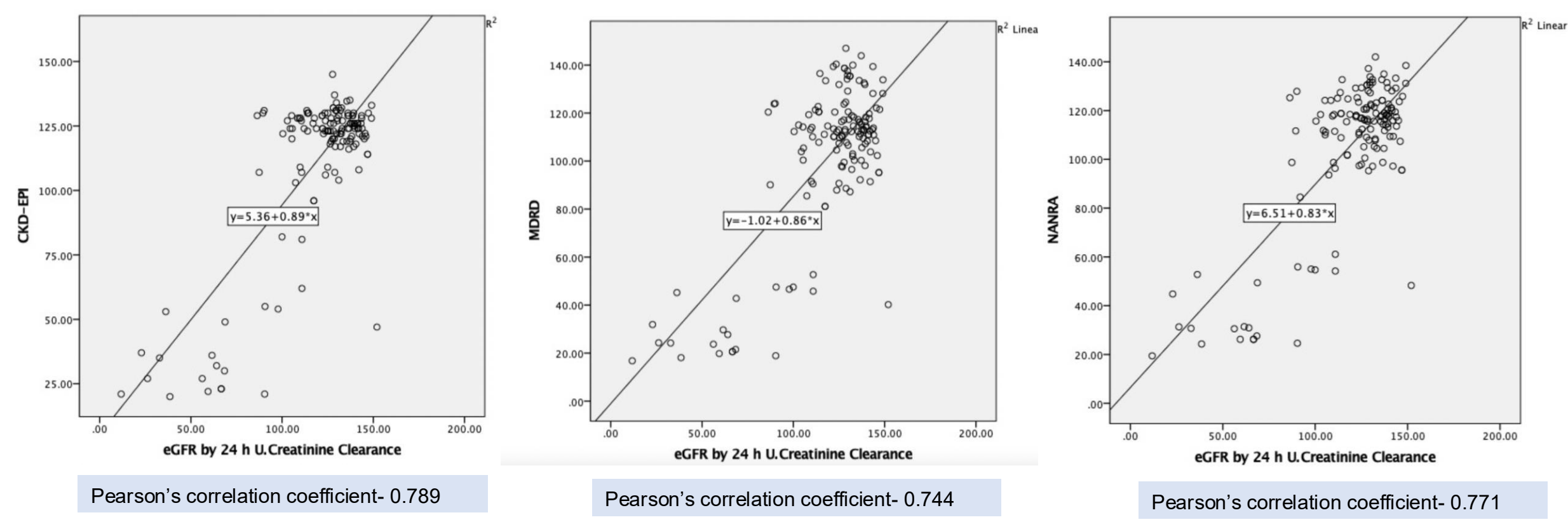


Table 2: Diagnostic accuracy of different methods of eGFR estimation to predict adverse maternal outcome

	24-hr urine creatinine clearance method	CKD-EPI	MDRD	NANRA
Area under curve	0.879	0.652	0.679	0.691
Sensitivity	100%	94.9%	94.9%	77.2%
Specificity	75.4%	44.6%	44.6%	60%
PPV	83.2%	67.6%	67.6%	70.1%
NPV	100%	87.9%	87.9%	68.4%
Optimum cut-off	121.9	114.0	92.2	112.4

Fig 2: Correlation of eGFR by 24-hr urine creatinine clearance & serum based methods



CKD EPI closely correlates with gold standard followed by NANRA & MDRD and can be used to measure eGFR in pregnant women

Table 1: Maternal complications in different subgroups

Complications	Group 1 (n=21)	Group 2 (n=30)	Group 3 (n=92)	Group 4 (n=1)	Test value (P value)
Gestational hypertension	0	0	0	0	-
Chronic hypertension	5 (23.8%)	9 (30%)	2 (2.2%)	1 (100%)	28.112 (<0.001)
NSPE	2(9.5%)	2 (6.7%)	13 (14.1%)	0	1.477 (0.688)
SPE	6 (28.6%)	19 (63.3%)	1 (1.1%)	1 (100%)	63.465 (<0.001)
Eclampsia	13 (61.9%)	7 (23.3%)	0	0	57.719 (<0.001)
Oligohydramnios	5 (23.8%)	5 (16.7%)	0	0	20.571 (<0.001)
Pulmonary oedema	11 (52.4%)	6 (20.0%)	0	0	47.590 (<0.001)
Renal dysfunction (Creatinine >1.1 mg/dl)	16 (76.2%)	4 (13.3%)	0	1 (100%)	85.588 (<0.001)
Preterm delivery	19 (90.5%)	27 (90%)	5 (5.4%)	1 (100%)	103.972 (<0.001)
Antepartum IUD	7 (33.3%)	2 (6.7%)	0	0	28.05 (<0.001)

Fig 4: ROC curve of eGFR to predict adverse maternal outcome

