



## Awareness and Application of Creatinine Clearance/eGFR in Non-Nephrology Doctors

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### ABSTRACT

**Introduction:** We conducted this study to determine the awareness of usage of estimated GFR/creatinine clearance formulas while dealing with patients in various wards and outpatient departments of different tertiary hospitals in Lahore in doctors who are not working or trained in nephrology, it was done by using a questionnaire in between January 2019 to May 2019. It was found that good percentage of doctor is not using basic formulas and need education by fellow nephrology colleagues for basic patient management, drug dosing, and referral. **Objective:** To study the awareness and usage of creatinine clearance calculations in doctors not trained in nephrology. **Study design:** Descriptive, cross-sectional study. **Methodology:** The cross-sectional observational study was conducted. A questionnaire was designed which included questions about knowledge of estimated GFR/creatinine clearance, calculation methods, use of these formulas while dealing with patients for defining and diagnosing AKI and CKD, medicine dosage adjustment according to creatinine clearance and referral to nephrologists. **Results:** A total of 170 doctors working in different specialties were contacted and all of them filled questionnaire. 56 (32.9%) doctors answered that they know and calculate eGFR in routine practice while 114 (67.1%) were not performing eGFR while encountering patients. 80 (47.1%) were confident in staging chronic kidney disease and 90 (52.9%) were unable to stage chronic kidney disease on basis of eGFR. In routine patients dose and adjustment according to GFR was documented by 39 (22.9%) doctors and 131 (77.1%) doctors were not practicing dose adjustments for different medicines after calculating GFR. Referral to nephrologist was being done 99 (58.2%) doctors and 71 (41.8%) were not referring patients to nephrologists. **Conclusion:** Several considerable challenges remain regarding CKD and AKI early diagnosis and management and referral in Pakistan including inadequate knowledge and training systems, and needs education in this regard.

**Keywords:** Acute kidney injury, Chronic kidney disease, Estimated GFR creatinine clearance

### INTRODUCTION

Kidney disease is a very common disease all over the world. Every 1 out of 10 adults worldwide has some form of kidney damage which includes 10.3% in Chinese, 11% in USA population, 15% in Iran and 10% in Netherland [1,2]. A study from Pakistan showed the prevalence of reduced GFR to be as high as 29.9% in a population comprising of individuals over the age of 40 years [3]. In another local study of patients with cardiovascular disease, the prevalence of CKD was 34%.

The burden of disease is very high all over the world and it is increasing over the passage of time [4]. Progression of AKI and CKD needs renal replacement therapy which is either dialysis or renal transplant which in either way is quite expensive treatment option. Its increasing prevalence in developing countries is a real challenge although burden and cost of disease are even becoming very difficult to combat in developed countries like USA [5]. The global cost of ESRD is more than 1 trillion US dollars. Total Medicare cost is excess of 28 billion US dollars. Pakistan Parliament passed a RS 3.2 trillion (33 billion US dollars) budget for fiscal 2012-13. Annual cost maintaining a patient on dialysis is PKR 150,000 which is very difficult to manage in a poor country anyway.

Chronic kidney diseases are caused by number of factors in which diabetes is the most common one. Others include

Hypertension, polycystic kidney disease, renal stones, and glomerulonephritis, etc. [6]. Acute renal impairment is caused by pre-renal, renal and post-renal insult which if not corrected in time can lead to chronic kidney damage. Important causes to look for in our local setups are diabetes, stone disease, over the counter NSAID use and Hakeem medication and failure of early diagnosis and referral.

Diagnosis of kidney disease has been established by KDIGO: Kidney Disease Improving Global Outcomes 2012 Guideline from the International Society of Nephrology and has been well introduced and being taught to medical graduates [7]. Similarly, RIFLE criteria for AKI hold place in diagnosis of acute kidney injury [8]. Estimated GFR by manual calculation (Cockcroft Gault), lab measurement, Smart ph and computer internet apps calculating estimated GFR by different formulas like CKD EPI and MDRD (modification of diet in renal disease) are important ones and is the easiest method to calculate eGFR and to diagnose stage and manage the disease [9-11]. Early detection and prevention stays the main target for doctors working in various departments should be aware of these calculations so that they can identify stage the disease at earlier stages [12]. Lack of knowledge and poor practices in early detection and prevention of the disease is one of the main reasons for so much disease burden and to meet this, health care professionals need to improve their knowledge and skills by the help of their nephrology colleague to control the disease especially in this part of the world.

## METHODS

A cross-sectional observational study was conducted. A questionnaire was designed which included questions about knowledge of estimated GFR/creatinine clearance, calculation methods, use of these formulas while dealing with patients for defining and diagnosing AKI and CKD, medicine dosage adjustment according to creatinine clearance and referral to nephrologists. They were further asked about the need for training and education by fellow nephrology colleagues. Answers to each question were recorded and analysed.

### Data Analysis

Data was entered and analyzed using SPSS 22. Frequency tables were generated for the age, sex, working specialty and knowledge about GFR, staging of CKD, Quantitative variables of the study like age were expressed as Mean  $\pm$  SD. Doctor's knowledge about calculation of eGFR, method of GFR calculation, staging of chronic kidney disease, dose adjustment according to eGFR and referral to Nephrologists were presented as percentage. Averages, mean, and analysis of variance was done where applied.

## RESULTS

A total of 170 doctors were contacted and all of them filled the questionnaire. Out of these, 89 (52.4%) were males and 81 (47.6%) were females. 49 (28.8%) doctors were of age <30. 107 doctors (62.9%) were between age ranges of 30-40 years. Only 14 (8.2%) were of 40-60 years of age. Out of these 58 (38.1%) were working in Medicine, 38 (22.4%) in Surgery, 34 (20%) in Gynae and Obstetrics and 40 (23.5%) were working in ICU. 56 (32.9%) doctors answered that they know and calculate eGFR in routine practice while 114 (67.1%) were not performing eGFR while encountering patients. The ones calculating eGFR use smart ph/internet app using different formulas are 38 (22.4%) and 25 (14.7%) were calculating by using Cockcroft-Gault calculator. Rest were taking help from lab. The patient was asked whether they knew or could stage chronic kidney disease and 80 (47.1%) were confident in staging chronic kidney disease and 90 (52.9%) were unable to stage chronic kidney disease on basis of eGFR.

In routine patients dose and adjustment according to GFR was documented by 39 (22.9%) doctors and 131 (77.1%) doctors were not practicing dose adjustments for different medicines after calculating GFR. Referral to nephrologists was being done 99 (58.2%) doctors and 71 (41.8%) were not referring patients to nephrologists. All doctors 170 (100%) agreed that they need to be educated regularly by their fellow nephrology colleagues about eGFR, its usage in daily practice and staging and managing disease (Tables 1-6).

Table 1 Statistics

		Calculating GFR	app/manual	Staging of kidney disease on basis of GFR	Dose adjustments according to GFR	Referral to nephrologists
N	Valid	170	170	170	170	170
	Missing	0	0	0	0	0

**Table 2 Doctors measuring eGFR/creatinine clearance**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	56	32.9%	32.9%	32.9%
	No	114	67.1%	67.1%	100%
	Total	170	100%	100%	

**Table 3 Method of GFR/creatinine clearance used**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Smart phone app	38	22.4%	22.4%	22.4%
	Manual	25	14.7%	14.7%	37.1%
	Lab	56	32.9%	32.9%	70%
	None	51	30%	30%	100%
	Total	170	100%	100%	

**Table 4 Staging of kidney disease on basis of GFR**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	80	47.1%	47.1%	47.1%
	no	90	52.9%	52.9%	100%
	Total	170	100%	100%	

**Table 5 Dose adjustments according to GFR**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	99	58.2%	58.2%	58.2%
	no	71	41.8%	41.8%	100%
	Total	170	100%	100%	

**Table 6 Referral to nephrologists**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	131	77.1%	77.1%	77.1%
	2	39	22.9%	22.9%	100%
	Total	170	100%	100%	

## DISCUSSION

Kidney disease is very common all over the world and it is increasing day by day. Acute kidney injury is being caused by factors like nephrotoxins, surgery, volume depletion, glomerulonephritis and use of contrast agents in modern medicine practice [13,14]. All ICUs have a good number of post-surgical patients having acute kidney injury, needing dialysis especially the ones being high risk like old age patients, diabetics, hypertensives [15]. In developing countries with poor resources, over the counter medications, hakeem medications, and quack practices the hospitals might see less percentage of the cases.

Chronic kidney disease in most cases being silent till the end especially when regular medical check-ups are not done is very much prevalent and is only picked up in late stages and once complications develop and this is the stage where it cannot be stabilized or reversed [16]. Cardiovascular disease is very common in CKD and is number one cause of death in these patients. Most of the patients reach late to tertiary care hospitals and usually diagnosed already in stage 4-5 where the treatment options left are usually the renal replacement therapy which is very costly treatment and in developing countries government hospitals can't take care of that much number of the patient and private sector cost is not affordable for many of the patients. So practically it is very alarming situation. Like every disease prevention is the key. So we need more efforts to prevent the disease. It can be done by educating general population about the disease, taking care of the causes, controlling blood pressure and blood sugars adequately, and controlling quackery and over the counter medications, etc. Health care professionals have the responsibility of controlling the causes and educating people.

After prevention, the second most important thing is early detection of the disease. Early detection has two targets;

one is patients attending health care facilities should be worked up for kidney disease especially the ones being at high risk. All junior doctors should be trained to practice getting urinary albumin/creatinine ratio, especially in diabetics, getting serum creatinine which is usually included in routine labs, calculating GFR, staging disease according to GFR and taking right actions accordingly. By doing this doctors will be sensitized to detect disease early and control it at early stages. Delaying progression of CKD is another target which will be achieved by working up patients staging them and referring them early to nephrologists.

Screening of the public will be a very important step and many nephrologists have started conducting screening of general population on world kidney day which identifies silent cases at early stages so help can be provided. Seminars and lectures are arranged to educate the public in this regard which could be great help. After conducting questionnaire it was seen that maximum doctors working in even tertiary care setups were not familiar with use of eGFR formulas, they are not using formulas are not staging disease and are not taking care of dose adjustments. There is a serious need of education general doctors about these things so that they may be great help at identifying and controlling disease burden. Similar results were seen in a study conducted in China [17]. Much is being done and more is needed and we hope to educate doctors further to get better control in future. My study has certain limitations. For the moment tertiary care doctors were contacted and primary or secondary health care departments were not contacted and it is expected to get more poor responses from there so next it should involve primary and secondary centers where more education and help is needed.

### CONCLUSION

The significant number of doctors even working in tertiary care hospital in big cities like Lahore are not familiar with eGFR measurement and its application in their routine practice which is big challenge for healthcare in controlling that much common disease. We, therefore, need more education and awareness programs to combat the situation.

### DECLARATIONS

#### Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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