

## Original Article

# Knowledge of Chronic Kidney Disease among MD Medicine Postgraduates and Residents

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**Introduction :** Physicians in India are frequently the first point of contact for patients with chronic kidney disease. Hence, awareness of clinical practice guidelines for Chronic Kidney Disease (CKD) among the Postgraduates/ residents of MD Medicine is of paramount importance. The aim of this study is to assess MD Medicine Postgraduates' and Residents' awareness and knowledge of clinical practice guidelines for Chronic Kidney Disease (CKD).

**Materials and methods :** The present study is a cross-sectional observation study. A questionnaire of clinical vignettes on CKD with multiple choices was prepared. A one-time survey of MD Medicine postgraduates and residents from various medical colleges in three states of southern India has been collected.

**Results :** A total of 228 Postgraduates or Residents of MD Medicine participated in the study. The awareness of clinical practice guidelines for CKD was low across all postgraduate years (PGYs) of MD Medicine. We measured the CKD awareness in postgraduates and residents of MD Medicine based on the Postgraduate year, Medical college and institute, type of institution (either Government funded or capitation fee), the presence of a nephrology fellowship in the institution, and the consultation given to the Nephrology patients in the Medicine OPD.

**Conclusions :** The modest awareness of clinical practice guidelines for CKD across all PGYs has suggested that incorporation of these guidelines into the medicine postgraduate training curriculum is not robust at present. We also discussed the means to improve the understanding of nephrology by the postgraduates/residents of MD Medicine.

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**Key words :** Chronic Kidney Disease, Clinical practice guidelines, Medicine postgraduates, Residents.

**C**hronic Kidney Disease (CKD) is defined as abnormalities of kidney structure or function, present for more than three months, with implications for health. (1) Albuminuria (AER>30 mg/24 hours; ACR>30 mg/g [ $>3$  mg/mmol]), urine sediment abnormalities, electrolyte and other abnormalities due to tubular disorders; abnormalities detected by histology; structural abnormalities detected by imaging; and a history of kidney transplantation are all markers of kidney damage. In addition, the Glomerular Filtration Rate (GFR) should be  $<60$  ml/min/1.73 m<sup>2</sup>.<sup>1</sup>

Globally, the incidence of CKD increased by 89% to 21,328,972 (uncertainty interval 19,100,079-23,599,380), prevalence increased by 87% to 275,929,799 (uncertainty interval 252,442,316-300,414,224), death due to CKD increased by 98% to 1,186,561 (uncertainty interval 1,150,743-1,236,564), and disability-adjusted-life years (DALYs) increased

### Editor's Comment :

■ With the information that the knowledge of CKD awareness is narrow, the means to improve the understanding of Nephrology by the Postgraduates and Residents of MD Medicine should be adapted. Such steps are: Nephrologists should highlight that the management of some conditions could be improved only after proper training in nephrology, eg, hyponatremia, anti-tuberculous therapy in renal failure, systemic lupus erythematosus, and renal artery stenosis. Nephrologists should also ensure that medical postgraduates or residents learn central vein catheter placement, which is at present expected as a basic skill for all Postgraduates or Residents.

by 62% to 35,032,384 (uncertainty interval 32,622,073-37,954,350)<sup>2</sup>. In the worldwide statistics, India is one of the countries with the highest rates of prevalence of CKD<sup>2</sup>. The prevalence of chronic kidney disease in India is reported to be between 0.78% and 17.2%<sup>3</sup>. The progressive nature of asymptomatic chronic kidney disease leads to an enormous social and economic burden for the community at large, in terms of burgeoning dialysis and transplant costs, which will only see an exponential rise in the next decade and will not be sustainable unless we reduce chronic kidney disease incidence and prevalence through screening and prevention. India can ill afford to manage all patients with End Stage Renal Disease (ESRD)<sup>4</sup>. The prevention of CKD is evolving as a crucial issue for the medical fraternity. Diabetes Mellitus and Hypertension

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constitute approximately 60% of all the causes of CKD. Both these diseases are also easy to diagnose, follow, and treat. The prevention of the complication of these diseases, CKD, entails involvement at every step, ie, physician, policymakers, government and patient. In the undergraduate medical curriculum, there is no significant mention of CKD as one of the topics to be read and understood. Physicians in India are frequently the first point of contact for patients with chronic kidney disease. Hence, awareness of clinical practice guidelines for chronic kidney disease among the postgraduates/residents of MD Medicine is of paramount importance.

The aim is to study the awareness and knowledge of MD Medicine Postgraduates and Residents on clinical practice guidelines for chronic kidney disease.

#### MATERIALS AND METHODS

We received the approval of the institutional ethics committee. The present study is a cross-sectional observation study. The questionnaire of clinical vignettes on CKD with multiple choices was adapted from the reference<sup>5</sup> with the permission of the authors. A one-time survey of MD Medicine Postgraduates/residents from various Medical Colleges in three states of southern India has been collected. The questionnaire had been sent by post or by messenger, and also circulated at an Andhra Pradesh Chapter of API conference at Kakinada. The participants are advised not to refer to a book or the internet during their response. We included the Postgraduates/Residents of MD Medicine of Sri Venkateswara Medical College, Tirupati, Andhra Medical College, Vishakapatnam, Rangaraya Medical College, Kakinada, Government Medical Colleges of Kurnool and Guntur, Government, Naryana Medical College, Nellore, Stanley Medical College, Madras Medical College, Osmania Medical College, Gandhi Medical College, Hyderabad; SRM Institute and SRMC Institute, Madras, Nizam's Institute of Medical Sciences and Sri Venkateswara Institute of Medical Sciences, Tirupati. In this list, three Medical Colleges are capitation fee colleges; two are institutes that have residency programs; and the remaining nine are Government Medical Colleges.

As this is an exploratory study on knowledge and awareness, the sample size is taken as high as possible, covering 14 institutions.

The official KDIGO guidelines formed the basis for the preparation of the questionnaire. The KDIGO guidelines were reviewed and domains pertinent to a physician offering pre-end-stage renal disease care were identified. The questionnaire consisted of the following 10 questions: 1. Core knowledge: 4 questions, 2. Risk

factors: 1 question, 3. Laboratory evaluation: 1 question, 4. Management of CKD: 1 question, 5. Medications: 1 question, 6. Complications of CKD: 1 question, 7. Referral to nephrology: 1 question.

The questionnaire was validated by three senior nephrologists. A pilot study was performed on medicine residents attending to nephrology postings at Nizam's Institute of Medical Sciences (n=37), who were excluded from the subsequent analysis. Based on the feedback obtained, we added a question about complications of CKD, which was not in the original list, and improved the clarity of the questions.

The four questions included in core knowledge are on the guidelines of CKD, the definition of CKD and the classification of CKD and hypertension goal. A total of 10 risk factors were given and responses were divided into percentiles. Similarly, A total of eight tests of laboratory evaluation for CKD, 7 aspects of management of CKD, five medications given and 9 complications are divided as percentiles.

#### Statistics :

Proportions were calculated from the total number of respondents for each question. Each correct option was given a score of 1. The performance score in each section is calculated as the number of correct responses expressed in percentage. The Kruskal-Wallis test was used to compare performance scores among three-year PGs and the Mann-Whitney U test was used to compare categorical variables.

Stepwise multi regression analysis was performed to determine whether overall knowledge is influenced by factors like postgraduate year, type of programme (government funded *versus* capitation fee), presence of nephrology fellowship, Medical College *versus* Institute and nephrology patients in OPD clinic.  $P < 0.05$  is regarded as significant.

#### RESULTS

A total of 228 postgraduates or residents of MD Medicine participated in the study. Incomplete responses have been excluded. From institutes, there were thirteen participants, and the rest (215) were from medical colleges. From the Government Medical Colleges, there were 149 (65.3%), and the rest was from 79 (34.6%) capitation fee colleges. The number of Postgraduates/residents of medicine according to the year of study was: Postgraduate year 1 (PGY1): 95 (41.6%), postgraduate year 2 (PGY2): 75 (32.8%); and postgraduate year 3 (PGY3): 58 (25.4%). The number of Postgraduates/residents with nephrology fellowships available at their institutes/medical colleges was 51 (22.3%) and not available in 177 (77.6%). The number of Postgraduates/residents who regularly gave consultation to nephrology patients in the Outpatient

Department was 184(80.7%) and those who did not were 44(19.2%).

Table 1 displayed the mean CKD awareness score for all 228 MD Medicine postgraduates or residents who took part in the study.

Table 2 showed that the nephrology patients in the Medicine OPD clinic had the highest impact on CKD awareness in Postgraduates/Residents of MD Medicine. The other factors in the descending order of influence were, type of programme: government *versus* capitation fee, year of postgraduation, medical college *versus* institute, and the presence of Nephrology fellowship.

Table 3 presents the overview of the responses of all Postgraduates/Residents of MD Medicine. Most postgraduates/residents of MD Medicine identified that the traditional CKD risk factors like diabetes and hypertension had chosen eGFR to assess kidney damage, were aware that the angiotensin converting enzyme inhibitor and angiotensin receptor blockers delay the progression of the CKD, more than 50% were aware that protein restriction, lipid control, glycemic control, and weight loss as preventive strategies and also identified when to refer to Nephrology.

### DISCUSSION

The awareness of clinical practice guidelines for CKD was low across all PGYs, (mean grand score: 52.75±15.25, Table 1). This modest understanding has suggested that incorporation of these guidelines into the medicine Postgraduate training curriculum is not robust at present.

We found postgraduates/residents in the 2<sup>nd</sup> postgraduate year of MD medicine to have significantly more awareness of guidelines in terms of core knowledge, risk factors, medications, management, laboratory tests, and complications when compared to postgraduates/residents in the 3<sup>rd</sup> and 1<sup>st</sup> year. However, there is no significant difference in referral to Nephrology. This attests to the fact that the Postgraduates/residents in the 2<sup>nd</sup> year are exposed to Nephrology in subspecialty rotations.

Table 1 — Mean score of CKD awareness for all 228 postgraduates/ residents of MD Medicine

	Mean score±SD
Core knowledge	52.52±27.70
Risk factors	69.82±21.99
Laboratory tests	57.38±27.19
Management	71.12±24.63
Medications	26.14±10.66
Complications	50.16±30.26
Referral to Nephrology	42.11±21.71
Grand score	52.75±15.25

Postgraduates/Residents of the 3<sup>rd</sup> year have lower scores compared to the 2<sup>nd</sup> year because they have a tendency to concentrate on other subspecialties key for the final practical examinations.

**Medical College *versus* Institute :** We discovered that residents in institutes had significantly higher awareness of laboratory evaluation and medication, but there was no significant difference in referral to nephrology or CKD management.

**Type of Institution *versus* CKD awareness :** Except for a referral to Nephrology, Postgraduates/Residents in Government-funded Medical Colleges/institutions had higher awareness in all domains than those in capitation fee Medical Colleges.

**Presence of Nephrology fellowship in the institution *versus* CKD awareness :** Postgraduates or Residents in Medical Colleges or institutes with a

Table 2 — Step wise multiregression analysis

Model	Coefficients <sup>a</sup>				
	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	40.620	2.140		18.983	0.000
Nephrology patients in OPD clinic	15.063	2.377	0.389	6.338	0.000
2 (Constant)	54.424	4.372		12.447	0.000
Nephrology patients in OPD clinic	10.811	2.601	0.279	4.156	0.000
Type of programme (Government funded <i>versus</i> capitation fee)	-7.709	2.146	-0.241	-3.592	0.000
3 (Constant)	49.854	4.622		10.786	0.000
Nephrology patients in OPD clinic	9.112	2.638	0.235	3.454	0.001
Type of programme (Government funded <i>versus</i> capitation fee)	-7.627	2.116	-0.239	-3.605	0.000
Year of postgraduation	3.170	1.157	0.168	2.740	0.007
4 (Constant)	42.105	5.922		7.110	0.000
Nephrology patients in OPD clinic	8.844	2.622	0.229	3.373	0.001
Type of programme (Government funded <i>versus</i> capitation fee)	-7.699	2.101	-0.241	-3.665	0.000
Year of postgraduation	2.979	1.152	0.158	2.585	0.010
Medical college <i>versus</i> institute	7.959	3.845	0.122	2.070	0.040
5 (Constant)	38.367	6.056		6.335	0.000
Nephrology patients in OPD clinic	10.606	2.693	0.274	3.938	0.000
Type of programme (Government funded <i>versus</i> capitation fee)	-6.924	2.102	-0.217	-3.293	0.001
Year of postgraduation	3.170	1.143	0.168	2.774	0.006
Medical college <i>versus</i> institute	9.996	3.895	0.153	2.567	0.011
Presence of Nephrology Fellowship	-5.503	2.266	-0.151	-2.428	0.016

<sup>a</sup>Dependent Variable: grand score

Table 3 — CKD knowledge in all medicine postgraduates and residents of MD Medicine

Question	PGY1 (n= 95)	PGY2 (n=75)	PGY3 (n=58)	All PGY (n=228)
<b>(Q1) He has CKD</b>				
Proteinuria tested twice	42	37	22	101(44.29%)
Needs eGFR<60ml/min/1.73m <sup>2</sup>	28	17	20	65 (28.50%)
He needs to have his urine tested again for proteinuria because 3 abnormal urine tests suggest CKD	16	19	15	50(21.92%)
Do not know	8	02	01	11(4.82%)
<b>(Q2) What are risk factors for CKD</b>				
Age > 60 years	64	61	45	70(30.70%)
African	37	42	34	113(49.56%)
American/Hispanic	45	46	24	115(50.43%)
Male	94	75	56	225(98.68%)
Diabetes Mellitus	91	74	55	220(96.49%)
Hypertension	37	55	37	129(56.57%)
Obesity	39	49	40	128(56.57%)
Systemic lupus erythematosus	27	43	28	98(56.14%)
Coronary artery disease	80	73	53	206(90.35%)
Daily NSAID use Family history of CKD	74	68	44	186(81.2%)
<b>(Q3) What tests would you request to assess kidney damage</b>				
Creatinine alone	18	4	1	23 (10.08%)
eGFR	71	68	54	193 (84.64%)
Urine analysis	47	49	28	124 (54.38%)
Urine dipstick for protein/albumin	24	25	15	64 (28.07%)
Random urine albumin/protein	10	12	7	29 (12.71%)
Random urine albumin/protein creatinine ratio	43	51	40	134 (58.77%)
24 hour urine creatinine clearance	39	31	27	97 (42.54%)
24 hour urine protein	38	45	34	117 (51.31%)
<b>(Q4) How do you manage her CKD</b>				
ACEi/ARB	64	63	49	176 (77.19%)
Protein restriction	47	50	36	133 (58.33%)
Salt restriction	69	67	49	185 (81.14%)
Lipid control	48	59	42	149 (65.35 %)
Glycemic control	59	67	50	176 (77.19%)
Weight loss	67	57	34	158 (69.2%)
Smoking cessation	70	57	41	168 (73.68%)
<b>(Q5) Which medications reduce proteinuria independent of BP</b>				
ACEi/ARB	91	68	51	210 (92.1%)
Diuretics	2	2	4	08 (3.5%)
DHP CCB	8	17	8	43 (18.85%)
Non DHP CCB	8	9	10	27 (11.84%)
Beta blockers	5	9	5	19 (8.33%)
<b>(Q6) What are potential complications when eGFR&lt;60ml/min/m<sup>2</sup></b>				
Anemia	91	74	54	219 (96.05%)
Bone disease	53	53	50	156 (68.42%)
Coronary Artery Disease	26	43	32	101(44.29%)
Stroke	20	37	27	84 (36.84%)
Malnutrition	24	33	26	83 (36.40%)
Dementia	9	19	19	47 (20.61%)
Diabetic complications	35	42	33	110 (48.24%)
Medication complication	39	44	32	115 (50.43%)
<b>(Q7) Referral to nephrologist GFR&lt;30</b>				
1	46	34	32	112 (49.12%)
2	46	39	33	118 (51.75%)
3	57	53	39	149 (65.35%)
4	2	1	2	5 (2.19%)
NSAID: non steroidal anti-inflammatory drugs, ARB: angiotensin receptor blockers, ACEi: angiotensin converting enzyme inhibitor, GFR: glomerular filtration rate, DHP: dihydropyridine, CCB: calcium channel blocker				

nephrology fellowship were better aware of laboratory tests and management. This is understandable considering the availability of the laboratory tests and possible interaction and exchange of knowledge with Nephrology postgraduates and residents. More importantly, there was no significant gain in domains where it is desired, like core knowledge, risk factors, and referral to nephrology.

**Nephrology patients in OPD versus CKD awareness :** We found the examination of CKD patients in Medicine OPD, led to a gain in knowledge of laboratory tests and complications. The knowledge of how to refer to Nephrology, however, remained a lacuna.

Knowledge of Nephrology referral remained an Achilles heel in all categories of MD Medicine Postgraduates and Residents.

**Why is CKD awareness low in Postgraduates/Residents of MD Medicine ?** The reasons are *hard to fathom why CKD* awareness is low. The conceivable reasons could be that the Guidelines for Hypertension and Diabetes mellitus are older, whereas the KDIGO guidelines are relatively new (2012) and some are still being developed and updated. The KDIGO guidelines are very extensive (163 pages) and not concisely presented, like other guidelines. CKD may be asymptomatic until later stages when uraemia sets in and causes nonspecific symptoms. During MD Medicine Postgraduate or Resident training, Postgraduates or Residents work with Nephrologists mainly in inpatient wards. Most patients in the inpatient wards have ESRD; the majority of these inpatients have complications of ESRD. Thus, the opportunity to learn CKD management is in OPDs and not appropriately given. While Davidson's Principles and Practice of Medicine, 23<sup>rd</sup> edition<sup>6</sup> and Kumar and Clark's Clinical Medicine, 9<sup>th</sup> edition<sup>7</sup> elaborate the pointers for referral of CKD patients to nephrology, several other standard textbooks of medicine referred to by the MD Medicine Postgraduates/residents understate it.

**What can be done to raise CKD awareness among Postgraduates/residents of MD Medicine?** The awareness of the CKD is a surrogate of

the awareness of the nephrology, as the CKD forms the principal part of the nephrology. Nephrologists should simplify the teaching of the subject for MD Medicine Postgraduates and residents to be enthused. By projecting the positive outcomes of these morbid events, we should wean off the general impression that Nephrology bristles with emergencies, complications, and effects of toxins. The strengths of Nephrology as a field that offers a diverse range of Medicine, including management of both acutely unwell individuals as well as long-term holistic patient care, should be highlighted. We should emphasise that nephrology is a branch of medicine in which the nephrologist has a regular (often thrice-weekly) engagement with patients and their families, to whom the nephrologist is an absolute specialist. Within renal medicine, there are many subspecialist areas, but a Nephrologist is also a generalist, often serving as the patients' GP (General Physician) once they have undergone transplant or are on dialysis. Nephrology encompasses every single part of a medical career, and most specialties do not. Nephrologists should supervise and ensure that medical Postgraduates or Residents learn central vein catheter placement, which is at present expected as a basic skill for all Postgraduates or Residents. The training programme for Postgraduates/Residents of MD Medicine must include a combination of a variety of in-patient, outpatient, and procedural experiences.

Nephrologists should highlight that the management of some conditions could be improved only after proper training in nephrology, eg, hyponatremia, anti-tuberculous therapy in renal failure, systemic lupus erythematosus, and renal artery stenosis.

The other sources of the attraction to the Postgraduates/Residents of MD Medicine should be Nephrology entails a variety of kidney patient Pathology, there are very few specialties that offer the breadth of conditions seen in Nephrology and the concept that as a Nephrologist one "never gets bored".

The present study had a few limitations. Of over 750 MD Medicine Postgraduate and Residents in our country, we surveyed only 228 students. We did not include DNB Medicine students, who manage patients in a different realm. In some institutions, a few students have chosen not to respond. We do not have data for non-responders, and we could not account for this bias. Respondents were self-selected to answer the questionnaire. This could have added another bias. The respondents might have chosen answers differently from an interviewer-administered questionnaire. We framed only a few questions testing each domain of CKD management, and this might less accurately test the level of knowledge. We did this to ensure acquiescent participation by students. We made the

questionnaire as practical/non-theoretical as possible. However we had the understanding that the merely asking questions did not assess the practical knowledge in nephrology entirely and why MD medicine Postgraduate and Residents were apathetic and were discouraged in Nephrology. But students in real patient management may perform better through prudence and teamwork.

### What is already known on this topic ?

India can ill afford to manage all patients with end stage renal disease unless we reduce chronic kidney disease incidence and prevalence through screening and prevention.

The present understanding is that the knowledge of a MD Medicine Postgraduate or a Resident is limited. As a result, the purpose of this study was to determine MD Medicine postgraduates' and residents' knowledge of clinical practise guidelines for chronic kidney disease.

### What this study adds ?

The study identified that MD Medicine Postgraduates and Residents have only a modest awareness of clinical practice guidelines for CKD.

### How this study might affect research, practice or policy?

With the information that the knowledge of CKD awareness is narrow, the means to improve the understanding of Nephrology by the Postgraduates and Residents of MD Medicine should be adapted. This study proposes such measures also.

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