Chronic kidney disease among rural population of Muzaffarnagar region

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Abstract

Introduction: Chronic kidney diseases (CKD) comprise the conditions that damage the kidneys and decrease their ability to keep you healthy by doing the jobs listed. If kidney disease gets worse, wastes can build up to high levels in the blood and make you feel sick.

Materials and Method: We screened 7462 subjects from outpatient department of Muzaffarnagar Medical College and Hospital from September 2016 to February 2017. Of the 7462 screened subjects, 6668 eligible subjects were enrolled in this study. We obtained personal and medical history data through a specifically designed questionnaire. Blood and urine samples were collected.

Results: In our study the prevalence of chronic kidney disease (CKD) was 11.19%. 52.95% chronic kidney disease patients were suffering from diabetes with hypertension, 29.49% from diabetes alone, 16.75% from hypertension alone and 0.8% from other diseases.

Conclusion: The major risk factor for chronic kidney disease (CKD) appears to be diabetes mellitus with hypertension which is taking a large chunk of the patients towards CKD than Diabetes or Hypertension alone.

Keywords: Chronic kidney disease, Diabetes, Hypertension, Serum Creatinine

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Introduction

Chronic kidney disease (CKD) is assuming epidemic proportions quite rapidly on a global scale.[1,2,3] In our country India too, it is also expanding rapidly, although exact figures vary[4] and can be attributed to the increasing prevalence of diabetes, hypertension, changes in lifestyle and other causes and to add to that, the poor awareness level among the people. At least 70% of the people live in rural areas with limited access to health care services with the result that chronic kidney disease is often diagnosed in advanced stages.[5]

Chronic kidney disease in the initial stages goes largely asymptomatic.[6] The probable benefits of early active management may include: reducing mortality and morbidity from cardiovascular diseases; progression to renal failure amongst patients with proteinuric disease; improving the quality of life for the patients with more severe symptomatic disease; and better usage of resources and decreasing the costs for health services.[7]

In 2003, the American Heart Association (AHA) regarded the patients of chronic kidney disease among the highest risk group for subsequent cardiovascular disease (CVD).[8] The opportunities of prevention are generally lost as the disease is largely asymptomatic in the initial stages. Early detection and treatment of chronic kidney disease can prevent the adverse outcomes such as the kidney failure.[9,10]

Abnormal kidney function can be defined as estimated glomerular filtration rate (e-GFR) <60 ml/min/1.73 m^2. The markers of kidney damage include the following: albuminuria, abnormal urinary sediments, renal tubular disorders, histological abnormality on renal biopsy, or structural abnormalities on renal imaging.[11]

Materials and Method

This study was carried out in the Outpatient Department of the Muzaffarnagar Medical College and Hospital, Muzaffarnagar from September 2016 to February 2017. The study was approved by institutional ethical research Committee and informed consent was taken prior to the study.

Inclusion Criteria and Exclusion criteria: We enrolled eligible adult outpatients (>18 years) receiving medical care at Muzaffarnagar Medical College & Hospital during the study period. Patients diagnosed with high blood pressure or on anti-hypertensive drugs, diabetes or on oral hypoglycaemic drugs or with both hypertension and diabetes were included in this study. Patients with known hepatitis B or C and HIV/AIDS were excluded.

Measurement of blood pressure: Trained personnel using a mercury sphygmomanometer (ACCOSON, England) with a standard or a large cuff, appropriate to the patient's size, were used to measure blood pressure after patients rested for 5 minutes, in accordance with recommendations of the American Heart Association Council on High Blood Pressure Research.[12]

Blood sample collection and processing: A 4 ml venous blood sample was collected from each

participant, 1 and 3 ml were dispensed into a fluoride oxalate tube and a serum gel separator tube respectively. After centrifugation at 1500 rpm for 3 minutes, the plasma and serum were assayed.

Biochemical analysis: Plasma fasting blood sugar levels were estimated by glucose oxidase peroxidase (GOD/POD) method (FBS), serum urea by urease method and serum creatinine by modified Jaffe's method by using automated chemistry analyzer (Turbo Chem 100). GFR (glomerular filtration rate) is estimated by serum creatinine based on equations rather than on direct measurements. Several equations have been developed and the most frequently used ones are the Cockcroft- Gault (CG) equation and the Modification of Diet in Renal Disease Study (MDRD) equation. Both equations are currently considered to be the best methods to estimate glomerular filtration rate (GFR) for adults in epidemiologic studies.

Urine sample collection and processing: Urinary Albumin (BCG method) and Creatinine (Jaffe's method) were estimated by using automated analyzer (CPC Turbo Chem 100).

Urine Albumin Creatinine ratio (uACR) = Urinary Albumin (mg/dl)/Urinary Creatinine (gm/dl).

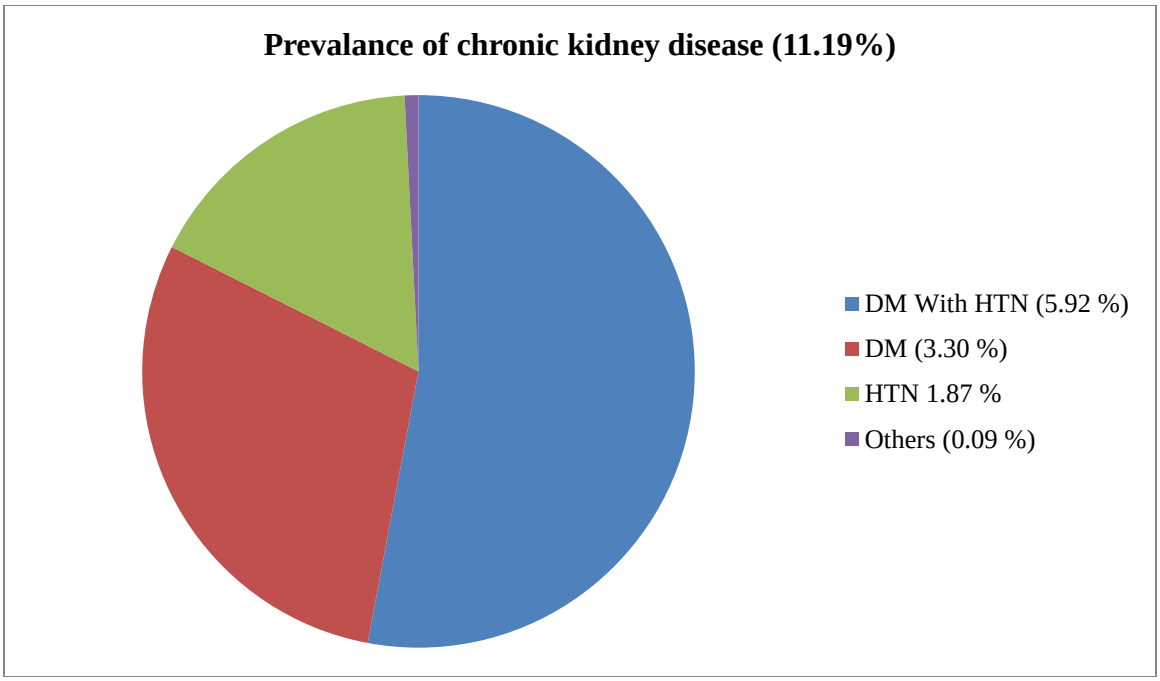
Statistical Analysis: Statistical analysis was performed by using Graphpad prism version 5.0 (GraphPad software, www.graphpad.com).

Results

Chronic kidney disease was defined as an estimate glomerular filtration rate (eGFR) <60 ml/min/1.73m^2 or urinary albumin creatinine ratio (uACR) ≥30 mg/g Creatinine.[11] Of the 7462 screened subjects, 6668 eligible subjects were enrolled for this study. The mean systolic and diastolic blood pressure and mean of general biochemical parameters like blood urea, serum creatinine, urine albumin, urinary albumin creatinine ratio (uACR) and estimate glomerular filtration rate (eGFR) are listed in Table 1. Out of the 6668 subjects 746 (11.19%) subjects were suffering from chronic kidney disease. Out of 746 chronic kidney disease patients 395 (52.95%) were Diabetic with hypertension, 220 (29.49%) were Diabetic, 125 (16.75%) were hypertensive and 06 (0.8%) were patients with other diseases.

Table 1: Shows the Mean value of Parameters in chronic kidney disease (CKD) patients

Variables	DM with HTN (395)	DM (220)	HTN (125)	Others (06)
Mean SBP (mm of Hg)	154	111.2	156	113
Mean DBP (mm of Hg)	99	75.4	97.9	75.7
Mean FBS (mg/dl)	173	172.1	101	91.2
Mean Blood Urea(mg/dl)	248	141	129.7	119.5
Mean Serum Creatinine (mg/dl)	3.53	2.88	2.81	2.2
Mean eGFR	22.46	26.05	28.16	32.95
Mean Urine Creatinine (g/dl)	3.74	3.68	2.74	3.58
Mean Urine Albumin (mg/dl)	1146.16	780.27	324.36	237.17
Mean uACR (mg/gm)	337.27	235.24	135.78	67.17



Discussion

Chronic kidney disease remains an important health issue worldwide altogether with India and requires close attention and monitoring as it puts a major restriction on the patient's quality of life, a major strain on the nation's economy and health care infrastructure.

Chronic kidney disease may be attributable to a number of etiologies such as kidney infections, glomerulonephritis, nephrotoxins and nephrotoxic drugs, along with existence of one of the several risk factors such as diabetes and hypertension. However, the leading cause of chronic kidney disease worldwide is diabetes.[13]

In our study the overall prevalence of Chronic kidney disease was 11.19%. Out of 11.19% chronic kidney disease patients, 52.95% chronic kidney disease patients were having Diabetes with Hypertension, 29.49% with Diabetes Mellitus, 16.75% with hypertension and 0.8% with other causes.

Increase in prevalence of type 2 diabetes mellitus (T2DM) and hypertension is associated with a consequent increase in the incidence of related microvascular and macrovascular complications, including kidney disease. Diabetics with chronic kidney disease can rapidly progress to end stage renal disease (ESRD) as the kidney function can rapidly deteriorate and routine dialysis and eventually renal transplant could be the only treatment option.[14]

Diabetes has been found to be the primary cause of kidney failure in nearly 45% of patients undergoing dialysis.[15,16] Fortunately, some of the adverse outcomes of chronic kidney disease can be prevented or delayed by early intervention, including optimal glycemic and blood pressure control.

Hypertension is one of the leading causes of chronic kidney disease due to the deleterious effects of increased BP on kidney vasculature. The glomerular filtration is impaired as the long term uncontrolled high blood pressure leads to high intraglomerular pressure and damage to the glomeruli. This leads to an increase in protein filtration, resulting in abnormally increased amounts of protein in the urine. Microalbuminuria is the presence of small amounts of albumin in the urine and is often the first sign of chronic kidney disease.

Stage 3 prevalence of chronic kidney disease was reported to be 0.785% in the urban South Delhi population, by Agarwal et al[17] by using serum Creatinine cut off of over 1.8 mg/dl. Limitations of this study are (i) Chronic kidney disease diagnosis is not based on glomerular filtration rate (GFR) (ii) patients with proteinuria have not been included (iii) Creatinine cut off is high; hence the reported figure is much lower than reported by other Indian studies.

Stage 3 prevalence of chronic kidney disease was also reported to be 4.2% in the urban and semi urban population of South Delhi by Singh et al.[18] Their study was based on GFR calculation by modification of diet in renal disease (MDRD) equation. However, they didn't repeat the proteinuria testing and study didn't address Chronic kidney disease stage 1 and 2. A study by Anupama et al[19] by using modification of diet in renal disease formula, found that the prevalence of chronic kidney disease was 16.54% in the Shimoga district of Karnataka.

Proteinuria ≥ 1+ on dipstick in 19% hypertensive subjects and 23.5% in chronic kidney disease (Estimate glomerular filtration rate < 60 ml/min/1.73 m2) subjects were observed by Farag et al.[20]

Rajapurkar et al[4] concluded that the commonest cause of chronic kidney disease was Diabetes Mellitus (31%). Other causes were chronic glomerulonephritis (14%) and hypertension (13%) of undetermined etiology (16%). About 48% of patients presented in End Stage renal Disease (ESRD).

Varma et al[21] in their study observed that 6.62%, 5.40% and 3.02% had chronic kidney disease stage I, II, III respectively.

Limitation of the study

One of the limitations of our study is that a single laboratory assessment was done to define the presence of CKD whereas the recommendation from international bodies is to rely on data from two visits 3 months apart. Despite this limitation, our study provides meaningful insights into the level of renal dysfunction in the studied diabetes population.

Further, we could have measured the overall outcome, lifespan and casualty in the studied patients, but difficult, as many patients either absconded or moved to higher centre for further treatment.

Conflict of interest: Nil

Conclusion

The overall prevalence of CKD in our region is slowly rising; this may be attributed to various factors including changes in the life style and/or related diseases. The major risk factor appears to be Diabetes mellitus with Hypertension which is taking a large chunk of the patients towards CKD than Diabetes and Hypertension alone. Generally in the Patients with the absence of care and awareness regarding optimal glycemic and B.P control, the condition i.e. CKD can be more severe.

We can take an assumption that more of the patients that suffered from hypertension along with diabetes mellitus progressed to Chronic Kidney Disease than diabetes mellitus or hypertension alone.

It appears from our study that strict glycemic and/or blood pressure control in the patients can have favourable outcome in reducing the severity and perhaps mortality and morbidity in diabetic and hypertensive patients.

References

1. Collins AJ, Foley RN, Chavers B, Gilbertson D, Herzog C, Johansen K, et al. 'United States Renal Data System 2011 Annual Data Report: Atlas of chronic kidney disease and end-stage renal disease in the United States. (e1-420).Am J Kidney Dis. 2012;59:A7. (PubMed).
2. Jha V, Garcia-Garcia G, Iseki K, Li Z, Naicker S, Plattner B. et al. Chronic kidney disease: Global dimension and perspectives. Lancet. 2013;382:260–72. (PubMed).
3. Couser WG, Remuzzi G, Mendis S, Tonelli M. The contribution of chronic kidney disease to the global burden of major non-communicable diseases. Kidney Int. 2011;80:1258–70. (PubMed).
4. Rajapurkar MM, John GT, Kirpalani AL, Abraham G, Agarwal SK, Almeida AF, et al. What do we know about chronic kidney disease in India: First report of the Indian CKD registry? BMC Nephrol. 2012;13:10. (PMC free article) (PubMed).
5. Agarwal SK, Srivastava RK. Chronic kidney disease in India: Challenges and solutions. Nephron Clin Pract. 2009;111:c197–203. (PubMed).
6. National Collaborating Centre for Chronic Conditions: Chronic kidney disease: national clinical guideline for early identification and management in adults in primary and secondary care. London: Royal College of Physicians; 2008.
7. Department of Health: The National Service Framework for Renal Services – Part Two: Chronic Kidney Disease, Acute Renal Failure and End of Life Care. London: Department of Health Renal National Service Framework Team; 2005.
8. Sarnak MJ., Levey AS.., Schoolwerth AC., Coresh J., Culleton B., Hamm LL. et al. Kidney disease as a risk factor for development of cardiovascular disease: a statement from the American Heart Association Councils on Kidney in Cardiovascular Disease, High Blood Pressure Research, Clinical Cardiology, and Epidemiology and Prevention. Circulation 2003, 108:2154-2169. (PubMed).
9. Locatelli F, Vecchio LD, Pozzoni P: The importance of early detection of chronic kidney disease. Nephrol Dial Transplant 2002, 17(Suppl 11):2-7. (PubMed).
10. Ruggenenti P, Schieppati A, Remuzzi G: Progression, remission, regression of chronic renal diseases. Lancet 2001, 357:1601-1608. (PubMed).
11. Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Chapter 1: Definition and classification of CKD. Kidney inter, Suppl. 2013; 3(1):19-62. (Elsevier).
12. Pickering TG, Hall JE, Appel LJ, Falkner BE, Graves JW, Hill MN, et al: Recommendations for blood pressure measurement in humans: an AHA scientific statement from the council on high blood pressure research professional and public education subcommittee. J Clin Hypertens (Greenwich) 2005, 7(2):102–9. (PubMed).
13. Atkins RC. The epidemiology of chronic kidney disease. Kidney Int Suppl. 2005;94:S14–8. (PubMed).
14. Fowler MJ. Microvascular and macrovascular complications of diabetes. Clin Diabet. 2008;26:77–82. (PubMed).
15. Stanton RC. Clinical challenges in diagnosis and management of diabetic kidney disease. Am J Kidney Dis. 2014;63:S3–21. (PubMed).
16. O'Hare AM, Bertenthal D, Covinsky KE, Landefeld CS, Sen S, Mehta K, et al. Mortality risk stratification in chronic kidney disease: One size for all ages? J Am Soc Nephrol. 2006;17:846–53.(PubMed).
17. Agarwal, SK., Dash SC., Irshad M., Raju S., Singh R., Pandey RM. Prevalence of chronic renal failure in adults in Delhi, India. Nephrol Dial Transplant 2005;20(8):1638-42. (PubMed)
18. Singh, NP., Ingle GK., Saini VK., Jami A., Beniwal P., Lal M., Meena GS. Prevalence of low glomerular filtration rate, proteinuria and associated risk factors in North India using Cockcroft-Gault and Modification of Diet in Renal Disease equation: an observational cross-sectional study. (L. B. Ltd., Ed.) BMC Nephrol. 2009;17;10:4. doi: 10.1186/1471-2369-10-4. (PubMed) (PMC free article).

19. Anupama, Y. J., Uma, G. Prevalence of chronic kidney disease among adults in a rural community in south India: Results from kidney disease screening project. Indian J Nephrol. 2015;24(4):214–221.(PMC free article) (PubMed).
20. Farag, MKY., Mittal BM., Keithi-Reddy SR., Acharya VN., Almeida AF., Anil C.,Farag BHS., et.al. Burden and predictors of hypertension in India: results of SEEK (Screening and Early Evaluation of Kidney Disease) study. BMC Nephrology 2014;15:42. (PubMed).
21. Varma, B. P., Raman, L. K., Ramakrishnan, L. S., Singh, L., & Varma, A. Prevalence of early stages of chronic kidney disease in apparently healthy central government employees in India. Nephrol Dial Transplant 2010;25(9):3011-17. (PubMed).