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Diabetes mellitus and end stage renal disease

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Abstract

Chronic Kidney Disease (CKD), Chronic Renal Failure (CRF), Chronic Renal Disease (CRD), and Chronic Renal Insufficiency (CRI) are various terms used varying between countries and time periods to refer to the same clinical entity. Chronic Kidney Disease is the standard accepted term currently and refers to kidney damage for three or more months, as defined by structural or functional abnormalities of the kidney, with or without decreased GFR, manifested by either: pathological abnormalities or markers of kidney damage, or GFR <60 mL/min/1.73 m2 for three or more months, without kidney damage. The most common causes of CKD are diabetes (Diabetic microvascular complications - Diabetic Kidney Disease <DKD>), and Hypertension. Diabetes Mellitus is the primary cause, present in 44% new cases of treated ESRD in 2002. Incidence is greater in blacks than whites, and higher in males than females. Final stage (stage 5) of CKD is End Stage Renal Disease (ESRD) or End Stage Renal Failure (ESRF). Broadly, the staging of Chronic Kidney Disease is based on GFR, and presence of pathology and/or markers of kidney disease. Stage one: GFR ≥90 mL/min/1.73 m^2, Stage two: GFR 60–89 mL/min/1.73 m^2, Stage three: GFR 30–59 mL/min/1.73 m^2, stage 4: GFR 15–29 mL/min/1.73 m^2, Stage 5 (End Stage Renal Disease): GFR <15 mL/min/1.73 m^2. One American study showed diabetic patients to have a relative risk (RR) of 12.7 compared to non-diabetics for developing diabetes related ESRD. Diabetics also had a RR of 4.3 when compared to non-diabetics in developing ESRD due to other, non-diabetes related causes. Diabetes incidence in Medicare population has increased 319% and as such, cases of ESRD are increasing. Low-level, chronic microalbuminuria is the early sign of onsetting diabetic renal pathology. Because proteinuria and high demand on glomeruli for increased sugar load processing in diabetic patients is at the heart of the pathology, treatment and prevention is aimed at reduction of said factors. Prevention is still the best way to approach diabetic kidney disease, and ESRD alike. A study was done in early 2013, which showed that aggressive insulin treatment for diabetics in attempts to bring HbA1c below 6.5% did not produce any other significant benefits for diabetics with the exception of delaying the onset of renal disease. A recent animal study showed that nuclear factor kappa B (NF-kB) signalling is an important pathological pathway in diabetes induced renal disease. Downregulation of Cx43 induced by high glucose activates c-Src. Activated c-Src promotes interaction between c-Src and IkappaB-alpha and contributes to NF-kB activation. This leads to renal inflammation. Treatments are aimed at control of diabetes initially, and use of insulin, and conventional anti-diabetic management methods are able to delay onset of renal complications. Vildagliptin, and Dipeptidyl peptidase-4 (DPP-4) inhibitors are found to be beneficial in patients with CKD. Bardoxolone is another drug that helps in diabetics with renal disease by controlling inflammatory pathways. Avosentan is also found beneficial by reducing renal protein excretion.

Biography

Anantha Krishna Chentha has completed his MBBS at the age of 23 years from Dr. NTR University of health sciences, Vijayawada, India. Later he worked as a medical officer and Junior Resident in various hospitals in Andhra Pradesh, India. He has deep interest in academic, passion for teaching and started “virtual library” for USMLE aspirants on Skype; he helped many students excel in their exams. He wants to pursue residency in the United States and is currently in the United States gaining US Clinical experience, rotating in different clinical setups and specialities.