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Review Article

Chronic Kidney Disease: Current Scenario of Diagnosis and Treatment in India

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Abstract

Chronic Kidney Disease [CKD] is one of the most burdensome disease with high mortality rate globally. Even though there are diagnostically accepted markers for the detection of CKD, the unreliability of the non-specific marker is a lacuna in the clinical world for an early prognosis and prevention of this chronic disease. Further, the economically challenging conventional treatment options available currently are a burden for many low-income countries to overcome this disease. This article discusses the current treatment scenario for CKD, and limitations of the diagnostic and treatment options available for CKD.

Keywords: Chronic Kidney Disease; Indian CKD Burden; Diagnostic Tools; Prognosis; Treatment and Limitations; Novel Biomarkers

Introduction

Chronic Kidney Disease [CKD] is an important cause of morbidity and mortality globally [1,2]. The global burden data from 2013 estimated that CKD caused almost a million deaths. This is one of the largest rises among the top causes of death from 1990 [2,3]. Constant efforts have been undertaken to improve the solution in kidney care [4,5]. Considering the morbidity and mortality of this fatal condition [6,7], this article attempts to highlight the burden of CKD in India, the current diagnostics and treatment in detailed sections.

Current diagnostic markers in CKD and its limitations

Serum creatinine

Current diagnostic marker used in clinic for assessment of CKD is through Serum Creatinine [sCr], Glomerular filtration rate [GFR] and Proteinuria, where, change in sCr is the core parameter for CKD diagnosis [8,9]. But, the measurement of creatinine from blood is prone to errors such as interference, insensitivity and imprecision [10]. Primarily, serum creatinine is not a disease specific marker and varies with many conditions such as muscle mass, muscle composition, protein content in the diet, drugs in the diet, etc. which result in imprecision of GFR calculation. Also, it has no correlation with co morbidities observed in CKD [10]. Further, the association of muscle mass with creatinine may result in similar sCr values for individuals with different GFR, which in turn results in false positive CKD diagnosis. Additionally, at least approximately 50% of GFR has to be lost before clinically detectable sCr elevation is observed beyond the normal limit [11]. By this time the disease has already progressed to third stage. This is due to inverse relation of GFR and sCr, which predicts that large reduction of GFR in a person results in only small increase in sCr and thus results in normal range despite substantial kidney functional deterioration [12,13].

Cystatin C

Cystatin C is a non-glycosylated protein which is completely metabolized in tubular cells. Presence of Cys C in urine and serum is an indicative of kidney damage [14]. However, this marker is influenced by factors such as thyroid disease, liver disease, smoking, age, weight, and CRP etc. which adversely indicated kidney damage. Cystatin C is also an inflammatory marker which can predict kidney damage better than sCr but is not an independent kidney damage marker [14,15].

Inulin

Recent studies have identified various biomarkers for early detection of CKD [16-18]. One of the exogenous gold standard marker used to assess GFR is inulin [19,20]. Inulin is an exogenous filtration marker which needs to be infused for its detection from urine and blood multiple times, which is a tiring and a cumbersome process. Another most recent kidney marker is iohexol which is injected and its clearance range from kidney is measured using HPLC methods. However, due to the complexity of detection, this marker is not diagnostically used [12].

Proteinuria markers

Markers such as proteinuria, albuminuria are also used as supporting markers with sCr and Cys C [9]. Urine contains traces of proteins. Persistent increase of proteins in urine is a sign of kidney damage and an increase in the ratio of albumin to creatinine is an indicative of kidney dysfunction. However, these markers do not contribute individually to kidney dysfunction and are not optimal for early detection. Blood Urea Nitrogen [BUN] is also assessed for kidney function but BUN varies independent of GFR as well based on diet and thus is not used as a marker [12].

Other clinically used markers

B2-microglobin is sensitive than Cys C and is elevated in kidney dysfunction, also with other conditions like infections, autoimmune disorders. B2-M is superior than Cys C as a marker for GFR assessment [21]. But a lack of further research on this marker limited its use in clinical diagnosis. In the current diagnostic setting, sCr and Cys C are used as endogenous markers for GFR calculations despite the limitations with measurements like diet, muscle mass, diabetes, etc. using predictive equations [22-24].

Limitation of existing markers in CKD diagnosis

The accuracy of GFR changes with the values of sCr and Cys C is limited and this causes a barrier for early detection of CKD much sooner than GFR is deteriorated drastically [25]. Additionally, the biomarkers are not validated in Asian phenotypes, whose diet and lifestyle is different from western system [26]. Assessment of ethnicity specific-biomarkers will provide better understanding on the diet and lifestyle impact on renal function [27]. There is a need to validate diagnostically effective markers of renal function which can help in early prognosis and prevention of kidney deterioration towards CKD.

Current scenario of CKD treatment

In terms of CKD treatment, the conventional approach of CKD management patients are advised to make changes to their diet like low protein diet restricted fluid intake, advice on diet to balance electrolytes etc [28-30]. Despite this, if kidney function is deranged as determined by serum creatinine, ultimately dialysis and renal transplantation are the only solution but associated with immense financial burden [31-34]. Also, there are complications of dialysis that include thrombosis, infection, ischemic steal syndrome, aneurysms, venous hypertension, hematomas, heart failure, and prolonged bleeding and result in frequent interventions and increased morbidity and mortality [35,36]. Moreover, these interventions are not only expensive, but also technically demanding [37]. As they require specialized surgical expertise, it is a challenge to make them available to all affected persons. In addition, severe shortage in the number of suitable kidney donors has been a major cause of huge waiting periods, also hampering the quality of life of the patient [38-40].

Conclusion

For persons living in low and middle-income countries including India, CRRT efficacy and safety are inadequate from multiple viewpoints namely information resources, material resources, time and money. An unprecedented rise in cases of hypertension, diabetes and other diseases that increase CKD risk has contributed significantly to the increase in CKD prevalence. Even in early CKD stages, the fatal as well as not-fatal risk of cardiovascular events directly attributable to kidney disease is substantially high. This puts an enormous pressure on health care resources. Therefore,

exploration of a kidney-specific diagnostic marker and a safe, non-invasive alternative therapy helpful in reducing the requirement of frequent dialysis and/or in postponing the renal transplantation can be a welcome change for the patients.

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Volume 4 Issue 11 November 2021