



International Journal of Nephrology & Therapeutics

Short Communication

Epidemiology of Chronic Kidney Disease - ②

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Submitted: 10 December 2015; **Approved:** 29 December 2015; **Published:** 31 December 2015

Citation this article: Fatt QK. Epidemiology of Chronic Kidney Disease. Int J Nephrol Ther. 2015;1(1): 001-003.

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SUMMARY

Chronic kidney disease (CKD) is a global public health problem worldwide. The worldwide prevalence of CKD has increased in various countries such as the U.S. (13.1%), Taiwan (9.8-11.9%), Norway (10.2%), Japan (12.9-15.1%) China (3.2-11.3%), Korea (7.2-13.7%), Thailand (8.45-16.3%), Singapore (3.2-18.6%), and Australia (11.2%) [1].

The different prevalence figures among different countries as well as within each country are mainly due to different methodologies used such as study design, creatinine measurement, formula for GFR calculation as well the study population.

Prevalence of CKD is derived from the estimation of glomerular filtration rate (GFR) which was based on equations on creatinine which were derived from Modification of Diet in Renal Disease (MDRD), Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) as well as new proposed formula based on cystatin C (CKD-EPI Cys) or creatinine and cystatin C (CKD-EPI Src-Cys). The latter new equations were found to reduce by half the prevalence of CKD (Stage 3) [2].

CKD has become a public health priority due to its impact on health and the economy. The progression of CKD will lead to end stage renal disease (ESRD), thus, this will increase the morbidity and mortality as well as the cost of medical treatment. Many countries have spent huge amounts of money on ESRD treatment. For example in the U.S., \$49 billion was spent in 2011 with overall treatment cost/person/year of approximately \$75000 [4]. In the U.K., it costs £30,000–£35,000 for hemodialysis treatment per person per year and £20,000–£25,000 for peritoneal dialysis [4].

Among the factors which contribute to the rise of CKD, hypertension (62.66%), primary kidney diseases (33.84%), diabetes (20.96%), and complicated ischemic disease (6.11%) are the most prominent contributors [5] followed by various other established risk factors such as ethnicity, age, low socioeconomic state, obesity, high cholesterol, smoking, family history of kidney disease.

In the U.S., hypertension is the second leading cause of ESRD [6]. Hypertension was found to occur in 86.2% to 95.6% of patients with chronic kidney disease especially in stage 3–5 [7]. Progressive kidney disease can further exacerbate the uncontrolled hypertension by expanding the volume and increasing the systemic vascular resistance volume. Although there are no clear guidelines currently on what SBP and DBP optimal levels need to be achieved for those who suffer from CKD especially stage 3-4. The 'Systolic Blood Pressure Intervention Trial' (SPRINT) [8] which was initiated in 2009 could address these issues without worsening the CVD [9].

Prevalence of CKD is also increasing due to the increase of diabetics in the population. For example, the prevalence of kidney disease in the U.S. due to diabetes has increased from 1998-2008 [10]. Diabetes Kidney Disease (DKD) will lead to microalbuminuria, impaired glomerular filtration rate (GFR) which then increases the risks of cardiovascular disease and deaths as well as increase the health care cost. Although diabetes management is able to reduce the progression of those who are suffering from CKD to ESRD, there are still controversies with regards to albuminuria measurement, management of hypertension; eGFR estimation, glycemic and lipid management (CKD and ESRD) [12].

CKD affects all ethnic groups. However, some studies found that

ESRD was higher among the blacks in the U.S. compared to the whites [12]. The blacks who have undergone kidney transplant surgery were found to have higher loss of kidney function and rejection compared to the whites especially in the younger age group [13]. The decline of kidney function before onset of CKD varies among various ethnic groups, and again the Blacks as well as the Hispanics have higher rates compared to the Whites [14]. The differences between the ethnicities could be due to genetic, biological, and environmental factors or a combination of the three.

In terms of gender, there are other studies which show diabetic men are at higher risk of developing CKD as well as ESRD than women. In a study of children, boys are more likely to suffer more than females due to the birth defect of the posterior urethral valve [15]. However, in contrast, there are studies which show diabetic women have a higher risk of developing CKD compared with diabetic men [16]. The reasons for the discrepancies were due to the latter study taking into consideration factors such as mortality, subjects over 65 years old, covariates and mediators and the use of eGFR by CKD-EPI equations or sex-specific microalbuminuria (UACR),

Since CKD is common among older people and its prevalence increases with age [17], this has raised an issue whether deterioration of kidney disease was due to advancing age. It was shown that the CKD markers are independently associated with the ESRD progression at whatever age [18].

CKD and its progression are prevalent among obese people. Those with metabolic syndrome are more likely to develop CKD, diabetes and heart disease. There are many evidence studies linking smoking and CKD. Smokers, particularly male smokers, were found to have higher risk of getting kidney failure compared to non smokers [19]. Family history also plays a vital role in CKD particularly in diabetic nephropathy and chronic glomerulonephritis. Liver disease such as non-alcoholic fatty liver disease has been found to be associated with increased risk of CKD [20]. The risk is further enhanced in those suffering from metabolic syndrome.

Socioeconomic factors are important determinants and were found to be associated with CKD. Education and income were found to be inversely correlated with ESRD [22]. Low awareness of CKD is a contributing factor to CKD. Low awareness of CKD was found to be more prevalent among those with low socioeconomic background and low education status.

As for management and prevention of CKD, it is important to ensure that all the modifiable risk factors are minimised. Any chronic condition such as diabetes or hypertension needs to be treated early and monitored closely to prevent or delay the development of CKD. There is also a need to create more awareness on CKD among the public as well as medical professionals so that early prevention measures can be taken. It is vital to identify early CKD since CKD is strongly associated with cardiovascular disease, hospitalization, quality of life and the risk of death as well as to prevent the progression to ESRD.

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