

EPIDEMIOLOGY OF KIDNEY STONES

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Abstract : Urolithiasis is a common condition with significant morbidity and if not treated is one of the common causes of Chronic Kidney disease. Prevalence of this condition varies with geographical location and is showing a rising trend in past two decades. Male subjects in their 3-4th Decade are more likely to suffer more so during summer months due to loss of fluid from extra renal sources. Calcium oxalate stones are the commonest. Diet, inadequate fluid intake, genetic factors, systemic and metabolic factors like diabetes mellitus constitutes risk factors for kidney stones. Left untreated it can be of immense economic burden; hence prompt recognition and treatment is warranted.

BACKGROUND

Urinary tract stone disease is a common condition with significant morbidity. Depending on the location of calculus in the urinary tract there are three distinct subgroups of urolithiasis; nephrolithiasis, ureterolithiasis and vesicolithiasis. While incidence of bladder calculi is decreasing, primarily due to increasing living standards it is still a common entity in societies with low per capita income. Many tropical countries, including India, till recently featured prominently in the 'endemic bladder stone belt'. With changing dietary patterns and living standards there has been an increase in incidence of upper urinary tract stone disease including nephrolithiasis¹. Epidemiological studies on kidney stone disease can enable us to quantify the disease burden and to formulate strategies to lower its incidence. The present article discusses some epidemiological aspects of nephrolithiasis in adult population.

INCIDENCE AND PREVALENCE OF KIDNEY STONE DISEASE

There is no population based data on incidence and prevalence of kidney stones in India. However, it is generally believed that risk of developing nephrolithiasis in normal adults is lower in Asia (1-5%) compared to the figures for Europe (5-9%) and United States (13%)². In a large population based study in United States, subjects with Asian descent had an intermediate prevalence of kidney stone disease (3.42%), Caucasians (5.78%) and Afro-Americans (2.95%)³. There has been a global trend of increasing prevalence of kidney stone disease over the past few decades. Whether this represents an actual increase or improved detection of stones is debatable⁴. A hospital based study from North India analyzing the stone composition of urinary tract stones demonstrated that, over a 20 year period, the proportion of upper urinary tract stones increased from 69% to 91%⁵.

AGE AND SEX DIFFERENCE

According to estimates from Western cohorts, males are two to four times more likely to be afflicted with kidney stone disease than females⁶. The incidence of kidney stones peaks around 40-60 years in males and around late 20s in females⁴. The only hospital based study from India which comments on age and sex distribution of upper urinary tract stones however also included children in the study population and did not give an age group wise breakdown of stone incidence. Nevertheless, they found that the mean age for stone formers was around 30 years (range 3-78 years) and males were twice more likely to have stones than females⁷. The lower risk of stone formation in females is believed to be due to a protective effect

of estrogen. This is further corroborated by studies which have demonstrated that estrogen supplementation in post menopausal females could decrease stone incidence⁸. The only study from India evaluating the influence of sex (males vs. reproductive females vs. menopausal females) in risk of urolithiasis demonstrated similar results⁹.

SEASONAL VARIATION

It is now generally believed that subjects in hotter climates have a greater predisposition for kidney stone formation¹. Formation of a concentrated, acidic urine and increased vitamin D production are the two principal factors believed to be contributing to this observation. In a population based study in United States, southern states which were closer to equator had a higher prevalence of kidney stones than the cold northern states after adjusting for other covariates³. A study in slum population of Mumbai failed to demonstrate any seasonal variation in recurrent stone formers which were presumed to have an underlying metabolic problem¹⁰. This could be related to the absence of extreme temperature fluctuations in Mumbai climate or the preponderance of calcium stones as upper urinary tract stones. A study from Western Australia also did not demonstrate any seasonal variation in incidence of calcium stones though they did find significant seasonal differences in incidence of uric acid and infection stones¹¹. However, studies from Rajasthan demonstrated a higher prevalence of urinary calculus disease there as compared to other parts of India¹².

COMPOSITION OF KIDNEY STONES

Many hospital based studies have assessed composition of upper urinary tract stones in Indian population¹³⁻¹⁵. The latest study analyzed 1,050 upper urinary tract calculi (900 renal and 150 ureteric) by X ray diffraction⁷. Calcium oxalate (CaOx) constituted 93% of all stones; in 80% of these it was in the monohydrate form (COM, whewellite) and in remaining 20% in the dihydrate form (COD, weddellite). While calcium oxalate stones are the commonest stones even in the Western population, the distribution of COM and COD stones is almost even. This is in contrast to Indian subjects where majority of CaOx stones were COM. The next most common stone (2.76%) in North Indians was of mixed type containing varying proportions of CaOx, calcium phosphate (CaP, apatite), uric acid and magnesium ammonium phosphate (struvite). Pure CaP, struvite and uric acid stones were found in <2% each. About 20% of 900 renal stones were staghorn calculi with majority (90%) being composed primarily of CaOx and not struvite as they are in western population. Though cystine and insoluble drugs like indinavir can