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The study of effect of climate and season of Bundelkhand region on urinary stones is important in the epidemiology of urolithiasis and evolving strategy for its control.

Jhansi district has hot and dry climate as revealed by meteorological data. Maximum monthly temperature occurs in the month of April, May and June where as maximum monthly stone cases occured in the month of June July and August. It shows that either maximum stone formation follows the maximum temperature period or the cases came to us shall have initiation of stone formation during this hot season. This data reveals that the high incidence of urinary calculi appears to occur 2 months following the achievement of the maximum mean annual temperature in this area. This study is similar to study of Prince and Scardine (1960) who noted that the highest incidence of urinary calculi appears to occur 1 to 2 months following the achievement of maximum mean annual temperature in their area.

Bateson (1973) concluded that peak incidence of urinary calculi coincides with the peak maximum
summer temperature, Rivera (1973) concluded that urinary calculi follow a recurrent annual cycle with increased occurrence during the hot months. Peak incidence immediately followed periods of higher temperature of increased humidity.

Minimum monthly temperature occurs in the month of December, January and February whereas minimum urinary stone cases occurred in the month of November, December and February. In the month of January a comparative higher incidence of stone disease was found than February. This shows that minimum monthly urolithiasis coincides with minimum monthly temperature with the exception of January which is the coolest month in Jhansi out the number of cases in this month were more in number than cases in December or February. The data reveals that the lowest incidence of urolithiasis appears to occur simultaneously with the minimum mean annual temperature in this area.

The highest humidity occurs in the month of July, August and September, which coincides with the high incidence of urolithiasis and lowest humidity which occurs in the month of February, March and April with nearly equal incidence of urolithiasis in each month. These data reveal that there should be some relationship
with humidity also as higher the humidity, more the occurrence of stone disease. We can not say the relative importance of temperature and humidity as without taking one of them constant one can not say about their relative importance, which is not possible for this region. These data coincides with the study of Rivero (1973) who stated that peak incidence immediately followed periods of high temperature, increased humidity, increased perspiration and slower winds, but Prince et al. (1956) stated that the relative humidity in their area (South eastern United States) ranged between 70 and 80 percent throughout the year and therefore did not appear to be related to peak incidence of urinary stone disease. In view of these conflicting data it appears that temperature remains the most critical factor.

The mean monthly rainfall in Jhansi district is highest in the month of June, July and August, which exactly coincides with the high incidence of urolithiasis. This is in contrast of Elliott (1975) study who concluded that peak stone incidence occurred during periods of above average temperature and below average rainfall.

A total of 399 cases of Renal stone were admitted in our study which is followed by incidence of vesical stones. Maximum monthly renal stone cases occu-
red in the month of June, July and August, whereas maximum monthly temperature occurs in the month of April May and June. It shows that maximum renal stone occurrence follows the maximum temperature period by two months. There is again a rise in the occurrence of renal stone cases in the month of January which is the month of lowest temperature in this area. Now this minimum temperature explains the moderately high occurrence of renal stones, can not be explained on this basis but the higher incidence of total urinary stone cases in the month of January should be because of this higher incidence of renal stones.

Minimum renal stone cases occurred in the month of December, February, May and November whereas minimum monthly temperature occurs in the month of December, January and February. This shows that there is no definite relationship with the occurrence of renal stone disease and lower atmospheric temperature in this region. The highest humidity occurs in the month of July, August and September which coincides with the high incidence of renal stone disease. These data on relative humidity reveal that there should be some relationship with humidity also as higher the humidity, more the occurrence of renal stone disease.

The mean monthly rainfall in this region is highest in the month of June, July and August which exactly coincides with the high incidence of renal stone disease.
A total of 207 cases of ureteric stones were admitted in our study period which shows a fairly high incidence.

The maximum monthly ureteric stone cases came to o/s in the month of June, through October, whereas maximum monthly temperature occurs in the month of April May and June. It shows that the highest, ureteric stone formation follows the maximum mean annual temperature by two to four months. This study is similar to study of Prince and Scardino (1960) on ureteric stones, who noted that highest incidence of ureteric calculi appears to occur 1 to 2 months following the achievement of maximum mean annual temperature in their area.

The minimum number of ureteric stone cases occurred in the month of December, January and February which coincides with the minimum monthly temperature. So it appears that lowest incidence of ureteric stone disease occurs simultaneously with the minimum mean annual temperature in this region.

The highest humidity occurs in the month of July, August and September which coincides with the high incidence of ureteric stone and lowest humidity which does not coincides with the lowest incidence of ureteric stones (December, January and February). The data reveal that
humidity does not have much significance on occurrence of ureteric stones. Prince et al (1956) also stated that the relative humidity in their area (South Eastern United States) ranged between 70 to 80 percent throughout the year and therefore did not appear to be related to peak incidence of ureteric stone disease.

The mean monthly rainfall in Jhansi district is highest in the month of June, July, August & September which exactly coincides with highest incidence of ureteric stone disease.

A total of 480 cases of vesical stones were admitted in this hospital in our study period which shows the highest incidence according to site. The maximum monthly vesical stone cases came to us in the month of June, July and August whereas maximum monthly temperature occurs in the month of April, May and June. It shows that the highest vesical stone formation follows the maximum mean annual temperature by two months. The minimum number of vesical stone cases came to us in the month of November and December, which coincides with the minimum monthly temperature. So it appears that the lowest incidence of vesical stone disease occurs simultaneously with the minimum mean annual temperature in this region. The highest humidity occurs in the month of July, August and September but there is a acute fall of vesical stone
cases in the month of September, and lowest humidity which occurs in the month of February, March and April which does not coincide with the lowest incidence of vesical stone cases.

The data reveals that humidity does not have much significance on occurrence of vesical stones. The mean monthly rainfall in Jhansi district is higher in the month of June, July and August which exactly coincides with highest incidence of vesical stone.

A total of 30 cases of urethral stone were admitted in our study period which shows a very low incidence. The number of urethral stone cases are so small that it can not be correlated with the monthly environmental temperature, humidity or rainfall.

The serum calcium was increased in 5.3% cases admitted in this hospital during our prospective study period. Hypercalcaemia may be produced by a number of clinical conditions like -

1. Hyperparathyroidism
2. Vit. D intoxication
3. Idiopathic infantile hypercalcaemia
4. Sarcoidosis
5. Multiple myeloma
6. Hyperparathyroidism
7. Metastatic malignant neoplasm
8. Leukaemia
9. Lymphoma

10. Milk alkali syndrome

11. Myxedema

12. Adrenal insufficiency

The problem of recurrent or bilateral urinary stones was investigated for hypercalcemia and hypercalciures.

Southerland reported an increased urinary excretion of calcium in nearly 60% of his series of patients with renal calculi. Boyce et al (1959) stated that 80% of patients with calculus disease requiring hospitalization had urinary calcium excretion rates in the so-called normal range (50 - 300) mg per 24 hours and each had only one or two calculi. The remaining 20% had recurrent or bilateral stones, and 80% of this group had hypercalciures. The presence or absence of calculi does not depend solely on the presence of hypercalciures, since many patients with no history of calculi excrete large amount of urinary calcium without forming calculi. With the exceptions of primary parathyroidism and certain malignant tumours that secrete excessive amounts of parathyroid hormone, most causes of hypercalcemia can be readily recognised from a carefully elicited history, a physical examination and appropriate radiological and
laboratory studies.

Oxalate crystals were found in the urine of 7.6% cases of urinary lithiasis and highest number of cases were of renal stones. As oxalate is a major factor in the formation of calcium oxalate stones so its presence in the urine of a patient can be correlated with causation of stone formation and may be helpful in the treatment like dietary control of oxalate rich food stuff, especially in the cases of multiple and recurrent stone disease problem.

Phosphate crystals were found in the urine of 3.3% cases of urinary lithiasis. Its presence in the urine of a known urinary stone patient can be correlated to the phosphate calculi causation and can be helpful in the treatment of phosphatic calculi eg. Aluminium gel 40 ml tds dc and at bed time drastically reduced the incidence of recurrence; excessive alkalinity of urine should be treated by giving ammonium chloride.

A total of 943 male and 175 female cases of urinary lithiasis were admitted in this hospital during our study period which gives male, female ratio of 5.4:1. The sex ratio is comparatively higher than the studies of Barley et al 1974, Burkland and Rosenberg 1955, Fetter and Zinskind 1961, Frank et al 1959. About three males were affected for every female in their study. With repo-
rts that increased serum testosterone levels resulted in increased endogenous oxalate production by liver (Liao and Richardson 1972), led Finlayson to postulate that lower serum testosterone may contribute some of the protection that women and children enjoy against oxalate stone disease. Recently Wilman and McGown (1975) have demonstrated increased urinary citrate concentration in urine of females and they postulate that this may aid in protecting females from calcium urolithiasis. We find lesser difference in the male/female cases of urolithiasis in upper urinary tract like renal and ureteric stone cases in comparison to lower urinary tract like vesical & urethral calculi, where urinary lithiasis is the problem of mainly males. Lonsdale (1968b) observed that incidence of upper urinary tract calcification is approximately equal in males and females at the time of autopsy.

Age distribution in urolithiasis shows that 25.4% were of pediatric age group, 52.6% of adult group and 21.9% of old age group. So the peak incidence of urinary calculi occurs in the adult age group (12-40 yrs.) that is from second to fourth decade of life. So the age incidence is comparatively earlier in our study than the study of Patter and Zimskind (1961) Frank et al (1959), who pointed out that the maximum incidence of urinary lithiasis appears to occur in the 30 to 50 yrs. age group.
Age incidence in renal stone cases shows that the percentage of paediatric age, adult age and old age were 8.0%, 69% and 23% respectively. So it is mainly adult age group (12 - 40 yrs.) who are involved in renal stone disease.

Age incidence in ureteric stone cases shows that the percentage of paediatric, adult and old age group were 9.2, 73.9 and 16.9 percent respectively. It again the incidence is maximum in the adult age group and paediatric age group is rarely involved.

Age incidence in cases of vesical stones shows that the percentage was 44.8%, 31.3% and 23.8% cases in the paediatric, adult and old age group respectively. So maximum incidence of vesical stones occurs in the first decade of life.

The age incidence in urethral stone cases shows that maximum incidence occur in the paediatric age group.