An Inexpensive Method for the Determination of Oxalate in Urine and Assessment of Hyperoxaluria by Nano-based paper Strip Technique

Preamble:-

The patients with kidney stone problems should control dietary oxalate intake to less than 40–50 mg per day. Therefore, determination of oxalate content in urine is important to patients with kidney stone problems. By detecting excess the oxalic acid concentration in urine on daily basis will be helpful to prevent the formation of kidney stone. Calcium oxalate stones are the most common type of kidney stone. Kidney stones are solid masses that form in the kidney when there are high levels of calcium, oxalate, cystine, or phosphate and too little liquid.

Primary hyperoxaluria type 1 (PH1) is caused by a deficiency of the liver peroxisomal enzyme alanine: glyoxylate-aminotransferase (AGT), which catalyzes the conversion of glyoxylate to glycine. When AGT activity is absent, glyoxylate is converted to oxalate, which forms insoluble calcium salts that accumulate in the kidney and other organs. Individuals with PH1 are at risk for recurrent nephrolithiasis (deposition of calcium oxalate in the renal pelvis/urinary tract), nephrocalcinosis (deposition of calcium oxalate in the renal parenchyma), or end-stage renal disease (ESRD) with a history of renal stones or calcinosis.

The study involved development of a simple, disposable paper –strip for estimation of oxalate in urine, that is easy to use and can be operated by any person, without the use of any special equipment. The developed strip is a low cost paper strip with nano-composites techniques along with color chart for rapid estimation (semi-quantitative) of oxalate in urine.

Features of the Technology:-

1. The enzyme linked Prussian blue nanozyme: an alternative method for the detection of oxalate in biological reaction developed.
2. Process for Detection of para-phenylenediamine by lateral flow method.
3. It can provide instant analysis of oxalate in urine, which can be conducted in absence of a laboratory facility and expensive equipment.
4. Strip for estimation of oxalate in urine is easy to use and can be operated by anyone.

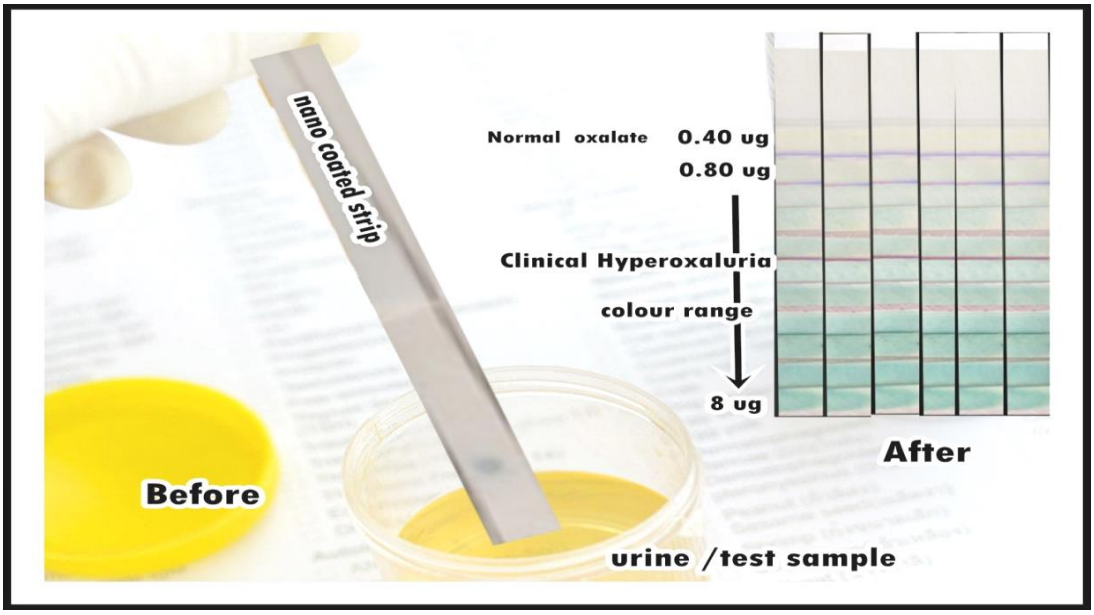
5. The strips developed can be very economical than the regular medical procedures available in the market such as Urinary Citrate and Oxalate test. The market test costs around Rs. 2500 per test while as the strip test can cost less than Rs. 300/-

Major Equipment Used:

- Synergy H1- Microplate Reader, with Gen 5 software:
  Make: Biotek Cost: Rs.14,22,750/-
- Leaf Av-Leaf Area measurement system:
  Make: Bovis Cost: Rs. 87,969/-

Product developed:-

Cellulose paper-based oxalate test strips were successfully prepared using PBNps linked ABTS as the chromogen agent.



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