

Renal Tubular Reabsorption of Phosphate

The ratio of the maximum rate of tubular phosphate reabsorption to the glomerular filtration rate (TmP/GFR) is the easiest way to assess renal phosphate transport. It corresponds to the theoretical lower limit of plasma phosphate below which all filtered phosphate would be reabsorbed. Measurement of PTH, which increases renal phosphate excretion, has largely superseded TmP/GFR. However, measurement of TmP/GFR may still be useful for assessing renal phosphate reabsorption in a small number of conditions associated with hypophosphataemia.

Indications for Measurement of TmP/GFR

TmP/GFR may be useful in the assessment of renal tubular reabsorption of phosphate in the following circumstances:

- Diagnosis of X-linked hypophosphataemic rickets, autosomal dominant hereditary hypophosphataemic rickets, autosomal recessive hereditary hypophosphataemic rickets with hypercalciuria and oncogenic osteomalacia (along with 1, 25 – dihydroxyvitamin D).
- Monitoring the response to growth hormone in X-linked hypophosphataemic rickets.
- Determination of the amount of intra-cellular phosphate repletion required following chronic hypophosphataemia.
- Investigation of renal stone disease (in the absence of hyperparathyroidism) to exclude tubular defects.

Procedure for Sample Collection

1. The patient must fast overnight
2. The following morning, the patient should discard the first urine passed and then collect the second urine passed into a plain container for measurement of phosphate and creatinine.
3. A serum sample should be collected on the same day as the urine sample for UE and phosphate.
4. The urine and serum samples should then be sent to the lab along with a completed request form which clearly states that TmP/GFR is required.

Note: The calculation will only be performed if both urine and serum samples are provided and if the serum phosphate is below the reference range. The TmP/GFR result will be added as a comment attached to the urine phosphate report.

Interpretation of TmP/GFR

A TmP/GFR below the reference range is suggestive of renal phosphate wasting. **The 95% reference range in adults is approximately 0.80 – 1.35mmol/L.** Some age-related reference ranges for TmP/GFR are provided below¹.

Adult Reference Range				
Age	Male Range (mmol/L)	n	Female range (mmol/L)	n
25-35 years	1.00-1.35	15	0.96-1.44	15
45-55 years	0.90-1.35	15	0.88-1.42*	15
65-75 years	0.80-1.35	15	0.80-1.35	15

*Premenopausal

Paediatric Reference Ranges		
Age	Reference Range (mmol/L)	n
Birth	1.43-3.43	20
3 months	1.48-3.30	20
6 months	1.15-2.60	20
2-15 years	1.15-2.44	101

1 Payne RB. *Renal Tubular reabsorption of phosphate (TmP/GFR): indications and interpretation.* Ann Clin Biochem. 1998; **35**: 201-206.