Study of FGF 23 (fibroblast Growth Factor 23) in Chronic kidney disease (Stage II to IV)

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Introduction :

- FGF23 (fibroblast growth factor-23) directly acts on the kidney to down regulate the production of 1,25-vitamin D_3 and the expression of the IIa and IIc sodium-phosphate co-transporters in response to phosphate overload in healthy individuals and in patients with CKD.
- Rising FGF23 levels in early stages of CKD are partially responsible for maintaining phosphatemia within the normal range
- Early management of serum FGF23 levels may prevent the premature decrease in serum 1,25-vitamin D_3 and the subsequent increase in serum PTH.
- Beneficial effects of lowering FGF23 levels are suggested by the correlation between FGF23, vascular calcification, CKD progression, and mortality

Objective:

- To study level of FGF-23 in patients with CKD II to IV attending O.P.D of Muljibhai Patel Urological Hospital.
- To elucidate the complex association between FGF 23, PTH, Vitamin D3 & phosphate in the same patients.

Methods:

- Cross-sectional study of 57 patients attending O.P of Muljibhai Patel urological hospital with CKD II to IV.
- Following parameters were studied
  - FGF-23 (two site enzyme linked immunosorbent assay kit- DRG International)
  - Biointact PTH (CLIA-Maglumi International)
  - Calcium, Phosphate
  - Urinary fractional excretion of phosphate
  - Urinary fractional excretion of calcium

Demography:

	ALL (n=57)	CKD-2 (n=5)	CKD-3 (n=24)	CKD-4 (n=28)
Age (Years)	48.9±3.4	50.2±11.4	49.8±13.5	48.1±13.9
BM(Kg/m^2)	24.45±5.5	33.3±2.8	25±5.3	22.4±4.6
Male (%)	43 (75.5)	4 (80)	18(75)	21(75)
Diabetes (%)	14 (24.5)	2(40)	6(25)	6(21.4)
CGN (%)	13(22.8)	0	8(33.3)	5(17.8)
Unknown (%)	23(40.4)	2(40)	7(29.2)	14(50)
Other(%)	7(12.3)	1(20)	3(12.5)	3(10.7)

Results: Lab Parameters

	ALL (n=57)	CKD-2 (n=5)	CKD-3 (n=24)	CKD-4 (n=28)
Calcium (mg/dl)	8.8±0.8	9±0.5	8.9±1.1	8.6±0.7
Phosphate (mg/dl)	4.1±0.85	3.5±0.7	3.8±0.6	4.4±0.9
Phosphate >5 mg/dl (%)	11(9.3)	0	0	11(39.3)
25D (ng/ml)	32.9±24	45.2±37	33.2±20.6	30.55±26.8
< 10 (deficiency)	2(3.5)	0	1(4.2)	1(3.6)
10-30 (insufficiency)	33(57.9)	3(60)	12(50)	18(64.3)
PTH pg/ml	66.9±55.3	68±77.8	68.9±53.3	65.1±13.9

Results: FGF in patients

	ALL (n=57)	CKD 2 (n=5)	CKD 3 (n=24)	CKD 4 (n=28)
FGF 23,pg/ml	25±16.2	18.6±13.2	22.7±14.5	48.1±18.4
FGF 23 >20 pg/ml (%)	29(50.8)	2(40)	11(45.8)	16(57.1)
$FePO_4$(%)	25.6±18.2	11.7±7.1	19±12	33.7±21.1

Results: FGF in Healthy Subjects

Age	gender	PO_4 (mg/dl)	FGF-23 (pg/ml)	$FePO_4$ (%)
32.6 ±8	Male (50 %)	3.5±0.7	11±5.3	7.3±3.3

Results Cont…

- Serum phosphate levels showed an inverse association with estimated GFR (eGFR), but were within the normal range in stage 2 & 3.
- FGF-23 (25 16.5 pg/ml) was greater than in healthy population(11 5.3 pg/ml).
- FGF-23 & fractional excretion of phosphate were inversely associated with eGFR.
- High FGF-23 levels were more prevalent than high PTH levels

Conclusions:

- It seems that FGF23 by increasing fractional excretion of phosphate maintains serum phosphate within normal range early stages of CKD.
- These findings provide additional support for use of FGF23 as a sensitive early screening test to identify disordered phosphorus metabolism in CKD patients with normal serum phosphate levels.

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