THE EFFECTS OF MATERNAL IRON STATUS ON INFANT FIBROBLAST GROWTH FACTOR-23 AND MINERAL METABOLISM

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INTRODUCTION

- FGF23 is a phosphate-regulating hormone which is regulated by dietary phosphate and $1,25(OH)_2D$ (Figure 1).
- Recently, i) iron deficiency has been shown to increase FGF23 gene expression and circulating FGF23 concentrations[1], ii) iron supplementation to decrease circulating FGF23 concentration[2] and iii) iron deficient pregnant mice produce offspring with elevated FGF23, low phosphate and abnormal bone mineralisation[3].

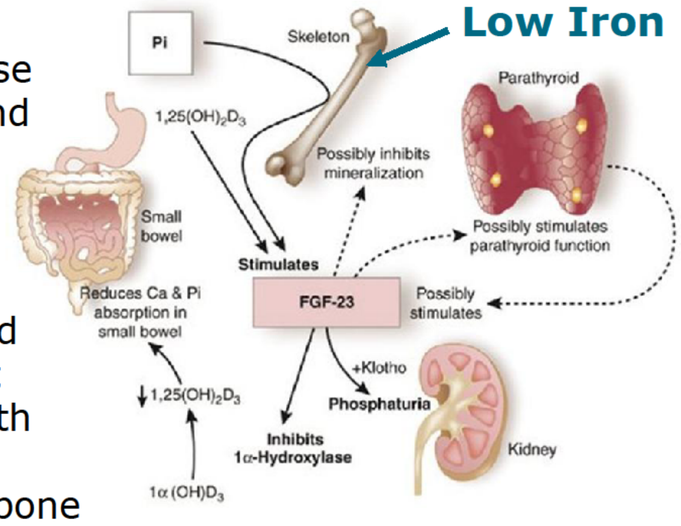


Figure 1. FGF23 regulation of phosphate metabolism

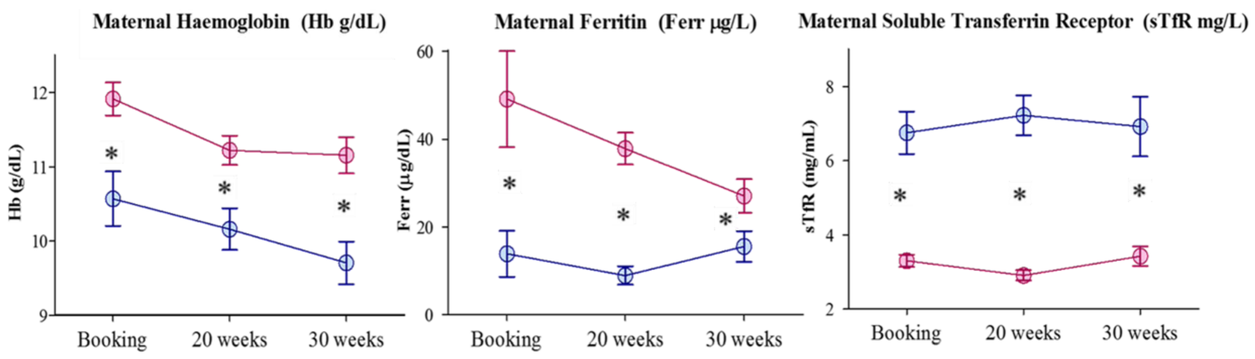
AIM

To investigate the impact of maternal iron status on infant FGF23 and mineral metabolites in humans over the first two years of life.

METHODS

- Maternal plasma samples from a mother-infant birth cohort (*n=400*) from rural Gambia, West Africa, were analysed for haemoglobin (Hb), ferritin (Ferr), soluble transferrin receptor (sTfR), and c-reactive protein (CRP) at booking, 20 and 30 weeks gestation.
- Mothers were split in two groups of **normal** (*n=25*) and **poor** iron status (*n=25*) based on their 20 week sTfR/log ferr index. All mothers had a CRP <5 mg/L.
- Corresponding infant anthropometry and plasma samples at week 12, 24, 52, 78, 104 of life were analysed for FGF23, phosphate, calcium, cystatin C, total alkaline phosphatase (TALP) and Hb.
- To determine time point differences in infants by group a hierarchical model was used with time point, WHO weight-for-age Z-score and ID nested in group with a timepoint*Group interaction. Post-hoc tests P-values (denoted by *, Figure 3) were reported.

RESULTS: Maternal Markers and Characteristics



	Poor iron (*n*=25)	Normal iron (*n*=25)	P-value
Mother			
Age@20wk (y)	29.4 (6.9)	29.5 (7.2)	*0.9*
Weight@booking (kg)	53.0 (8.4)	58.0 (11.8)	*0.1*
Height@booking (cm)	161.7 (6.2)	160.1 (7.1)	*0.4*
BMI (kg/m²)	20.6 (2.7)	22.1 (4.2)	*0.2*
1st pregnancy (N/Y)	18/2	19/5	*0.2*
# of live children	3.8 (2.7)	3.4 (2.6)	*0.6*
# of dead children	0.4 (0.7)	0.3 (0.7)	*0.5*
Infant			
Sex (F/M)	10/15	13/12	*0.4*
Birth weight (kg)	2.86 (0.28)	3.03 (0.38)	*0.1*
Gestational Age (wk)	40.0 (1.0)	39.9 (1.26)	*0.8*
Cord Blood Hb (g/dL)	13.8 (2.4)	13.3 (2.7)	*0.6*

Figure 2. Graph of maternal iron status [mean (SEM)] at booking, 20 and 30 week split by **normal** and **poor** iron group and table of maternal and infant characteristics [mean (SD)]. *indicates P<0.05.

RESULTS: Infant Markers by Maternal Iron Status

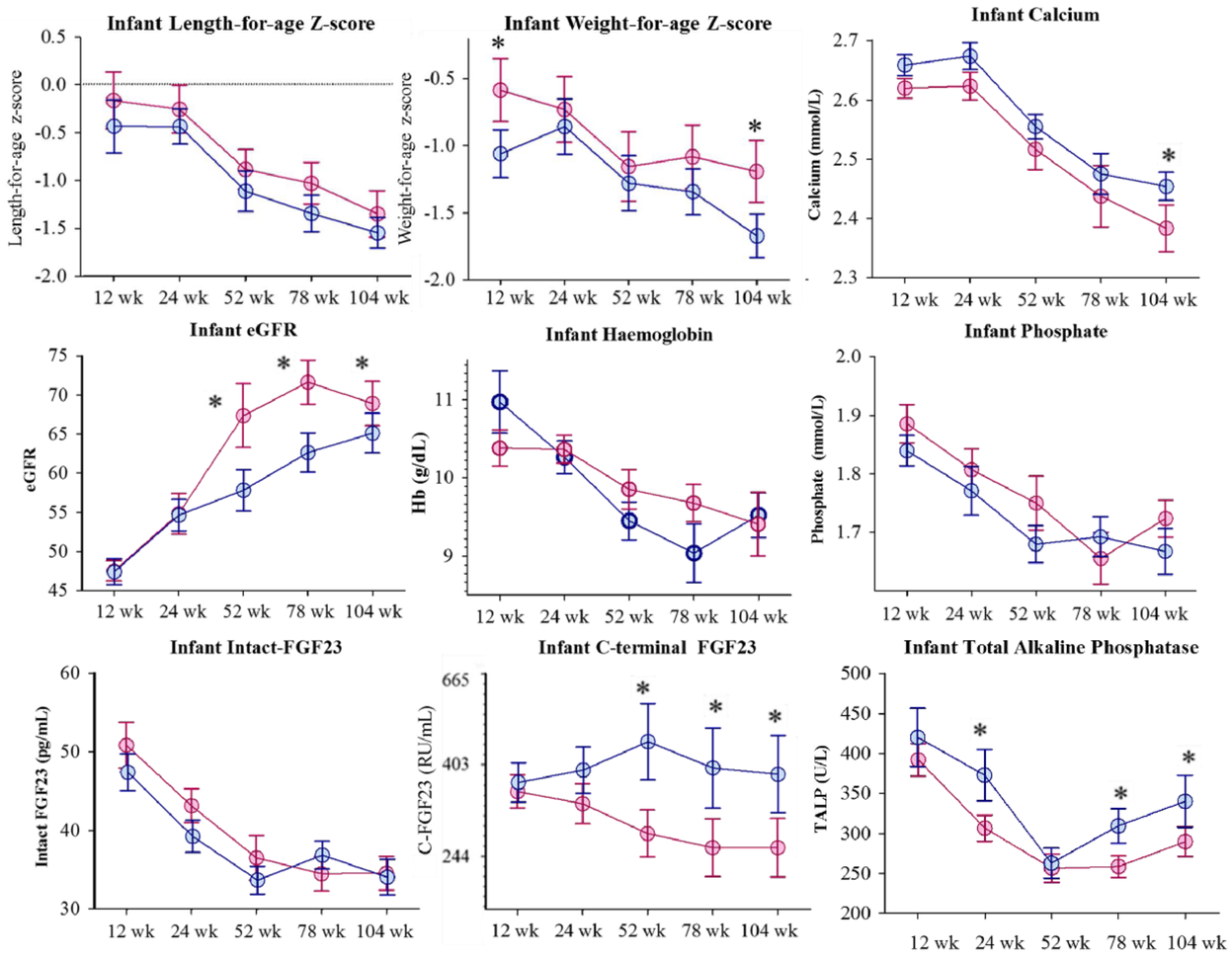


Figure 3. Infant data split by maternal **normal** and **poor** iron status. Graphs mean (SEM) and significant differences between groups are indicated by *.

- Infant Hb was the strongest negative predictor of C-FGF23 [β (SE)-104 (27) RU/mL, P≤0.0001; group difference P=0.03].
- Infant phos was the strongest positive predictor of I-FGF23 [31 (4) pg/mL, P≤0.0001, group difference P=0.8].
- I-FGF23 did not predict C-FGF23 overtime but the relationship was different by group [-2.7 (3.6) RU/mL, P=0.5, group difference P=0.03].

CONCLUSIONS

- **Children born to mothers with poor iron status have higher C-FGF23 and TALP from 24-52 weeks until 2 years both with and without adjustment for infant weight-for-age Z-score and infant Hb.**
- **This may result in poorer bone health in children born to iron deficient mothers.**
- **These findings further highlight the public health importance of preventing iron deficiency during pregnancy.**

ACKNOWLEDGMENTS & REFERENCES

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[1] Braithwaite V et. al. Iron Status and fibroblast growth factor-23 in Gambian children. *Bone* 2012

[2] Braithwaite V et. al. FGF23 is correlated with iron status but not with inflammation and decreases after iron supplementation: a supplementation study. *Int J Pediatr Endocrinol* 2012

[3] Clinkenbeard E et al. Neonatal iron deficiency causes abnormal phosphate metabolism by elevating FGF23 in normal and ADHR mice. *J Bone Miner Res.* 2013.

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