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The Relationship Between Iron Status, Limb Movements, and Sleep Architecture in Children

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Background

- Iron status is an important aspect of the evaluation of children with excessive limb movements during sleep.
- While there is clear data in adults to support this relationship, the data in children is less well established.
- We evaluated the association between iron status and limb movements during sleep in a large pediatric sample.

Methods

- This is a retrospective analysis of a single institution sleep program looking at all patients who underwent overnight polysomnogram and ferritin test within 24 hours of doing the sleep study between January 2015 and October 2017.
- Those with sleep apnea (Central Apnea Index >5/hr or Obstructive Apnea Hypopnea Index >2/hr) were excluded.

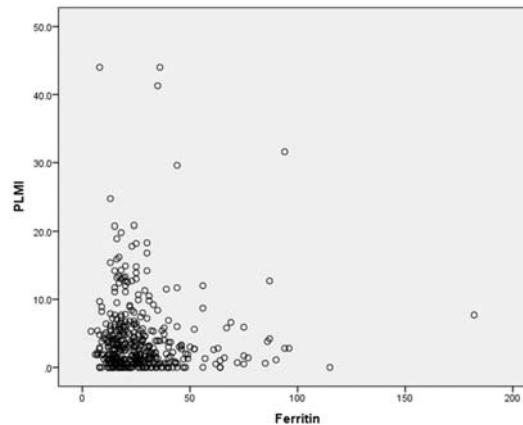
Results

Variable	Value (mean, (SE)), n=418
Age (yrs)	5.6 (0.1)
Ferritin	27.0 (0.8)
Sleep architecture	
N1	4.8 (0.1)
N2	42.3 (0.4)
N3	33.2 (0.4)
R	19.7 (0.2)
Arousal	
Total AI	9.8 (0.1)
Spontaneous AI	3.8 (0.1)
Limb movement AI	5.3 (0.1)
Limb movements	
Total LMI	11.8 (0.3)
Periodic LMI	4.1 (0.2)
Single LMI	7.7 (0.1)

Variable	Pearson Correlation with ferritin level (p<0.05, **p<0.01)
Age (yrs)	0.15**
Sleep architecture	
N1	0.06
N2	0.18**
N3	0.08
R	-0.19**
Arousal	
Total AI	0.08
Spontaneous AI	0.146**
Limb movement AI	0.05
Limb movements	
Total LMI	-0.04
Periodic LMI	0.002
Single LMI	-0.10*

Variable	Ferritin <50 (n=399)	Ferritin >=50 (n=32)	2 tailed p-value
Age (yrs)	5.3 (0.4)	6.59 (2.5)	0.114
Sleep architecture			
N1	4.7 (2.8)	5.0 (2.5)	0.825
N2	42.1 (8.2)	45.9 (11.7)	0.016
N3	38.4 (8.1)	31.6 (9.8)	0.200
R	19.8 (5.4)	17.9 (6.6)	0.056
Arousal			
Total AI	9.8 (4.0)	10.2 (2.7)	0.568
Spontaneous AI	3.5 (3.3)	4.1 (2.3)	0.305
Limb movement AI	5.3 (2.6)	5.2 (2.0)	0.791
Limb movements			
Total LMI	11.9 (7.5)	11.7 (6.9)	0.910
Periodic LMI	4.3 (0.7)	4.1 (0.5)	0.962
Single LMI	7.7 (3.4)	7.5 (2.7)	0.736

Variable	Ferritin <30 (n=299)	Ferritin >=30 (n=123)	2 tailed p-value
Age (yrs)	5.3 (0.4)	5.3 (2.6)	0.013
Sleep architecture			
N1	4.7 (2.8)	4.9 (2.1)	0.613
N2	41.7 (8.0)	43.9 (9.6)	0.014
N3	33.5 (8.0)	32.6 (8.9)	0.318
R	20.1 (5.1)	18.6 (6.2)	0.018
Arousal			
Total AI	9.7 (3.2)	10.1 (5.4)	0.389
Spontaneous AI	3.4 (2.4)	4.0 (4.6)	0.072
Limb movement AI	5.4 (2.3)	5.1 (4.1)	0.460
Limb movements			
Total LMI	12.1 (7.3)	11.3 (7.9)	0.320
Periodic LMI	4.1 (0.3)	4.1 (0.9)	0.928
Single LMI	7.9 (3.6)	7.2 (2.7)	0.040



Results (cont)

- There were a total of 418 patients who qualified for inclusion. Mean age was 5.6 years (range 0–19 years).
- Overall, higher ferritin level was significantly associated with increasing age, increasing N2 sleep, lower REM sleep and lower single limb movement index but did not correlate with periodic limb movements of sleep.
- It appears that ferritin level at 30 nanograms per milliliter is the cutoff to make a difference in improving single limb movements (7.2+/-2.7 vs 7.9 +/- 3.6 for above and below 30 ng/ml, respectively).
- In multivariate regression modelling including single limb movement index and age, the association between ferritin and limb movements was no longer significant.

Conclusions

- Overall, there is a weak correlation between ferritin and single limb movements during sleep.
- However, it appears that age is an important possible confounding factor in the complex relationship between and iron status and limb movements in children.