

Postural tachycardia syndrome associated with ferritin deficiency

Daniel Wallman, BSE, Zetta Fayos, M.D. , Janice Weinberg, D.Sc. and Anna Hohler, M.D.
Boston University School of Medicine, 72 East Concord Street, #A302, Boston, MA.

Introduction

- Postural Tachycardia Syndrome (POTS) is a condition caused by an underlying autonomic dysfunction.
- Adult patients suffering from POTS experience an increase in heart rate of greater than 30 beats per minute often accompanied by a drop in blood pressure when moving from a supine to upright position; adolescents exhibit an increase in heart rate greater than 40 beats per minute.
- The dysfunction of the sympathetic system leads to an insufficient cardiac and vascular tone upon standing and patients often present with frequent episodes of syncope and pre-syncope (Thieben, 2007).
- In a significant subset of POTS patients, no etiology can be identified.
- This study focuses on the potential connection between low serum ferritin, POTS and the prevalence of comorbid conditions.

Results

Overall	POTS (+)	N	Mean Ferritin	SD	Mean Age	SD
	(+)	33	37.1	35.5	32.33	12.14
	(-)	53	57.92	56.02	47.92	13.22
	Difference	SE	P Value			
T-Test	-20.7	10.92	0.0613	-	-	-

Table 1a: Statistical analysis of female autonomic dysfunction patients with POTS and without POTS. N = number, SD = Standard Deviation, SE = Standard Error

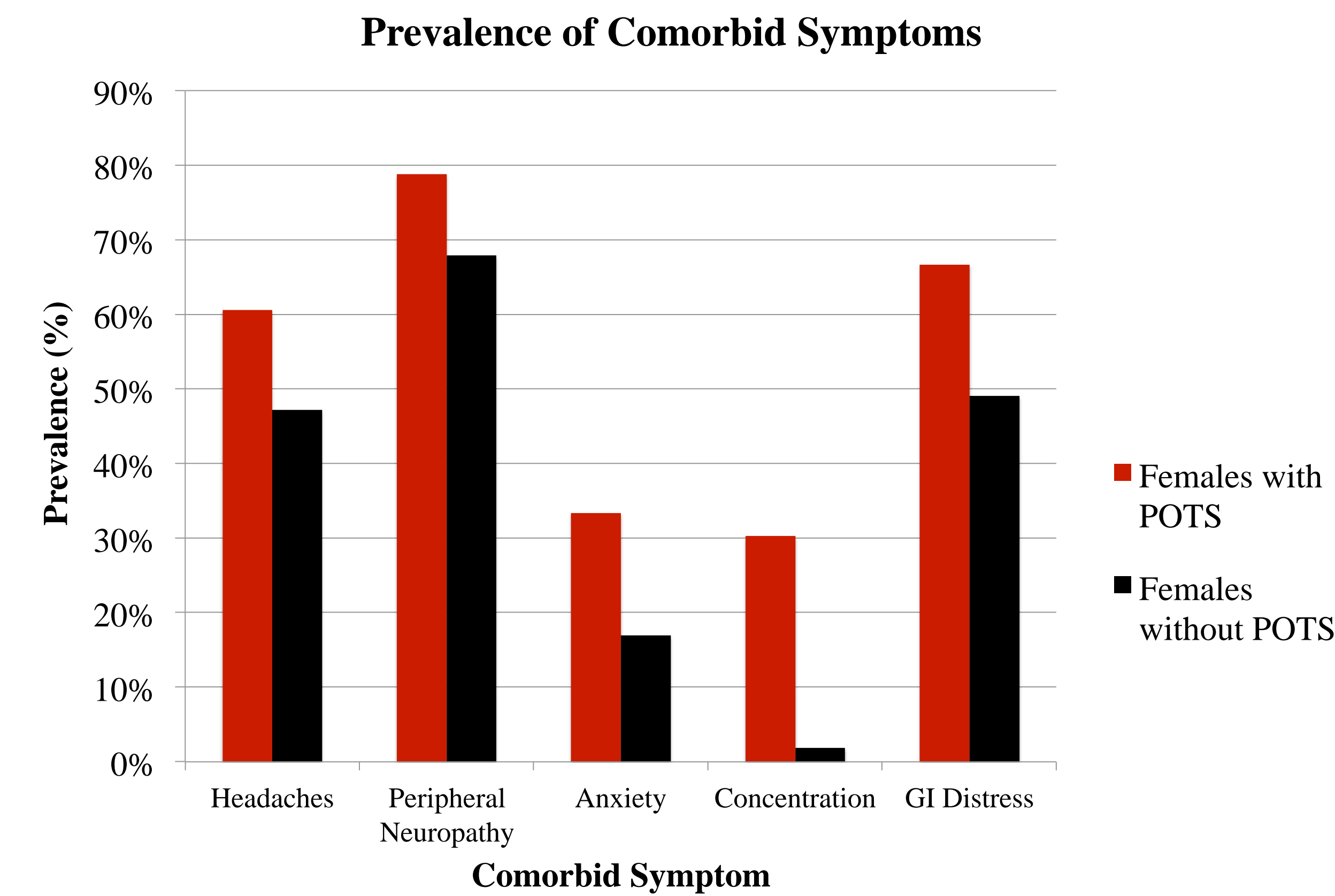
Ferritin Threshold Analysis	Ferritin ≤ 50 (ng/mL)	Age ≥ 50	N POTS (+)	% POTS (+)	N POTS (-)	% POTS (-)
(-)	N/A		7	23.33	23	76.67
(+)	N/A		26	46.43	30	53.57
(-)	(-)		6	42.86	8	57.15
(+)	(-)		23	56.1	18	43.9
(-)	(+)		1	6.25	15	93.75
(+)	(+)		3	20	12	80

Table 1b: Analysis of patients above and below the a defined Ferritin Threshold amount (50 ng/mL) and age threshold (50 yo).

Logistical Regression Analysis	Ferritin ≤ 50 (ng/mL)	Age ≥ 50	Odds Ratio	95% CI Lo	95% CI High	P Value
(+)	N/A		2.848	1.052	7.708	0.0394
(+)	(-)		1.704	0.5	5.8	0.394
(+)	(+)		3.75	0.345	40.797	0.28

Table 1c: Logistical regression analysis between Ferritin Concentration, Age and POTS. CI = Confidence Interval

- The odds of having POTS for patients with low ferritin levels is 2.8 times the odds for those with higher ferritin (CI = 1.1 – 7.7, p=0.0394) (table 1c).
- The mean ferritin level of 37.1 ng/mL (SD = 35.5) in POTS patients was lower than the mean serum ferritin level of 57.8 ng/mL (SD = 56.0) in patients without POTS (p=0.0613) (table 1a).
- The percentage of patients with POTS nearly double in patients who exhibit serum ferritin levels below 50ng/mL (23.3% vs. 46.4%) without stratifying by age (table 1b).



- The prevalence of all five comorbid symptoms is higher in our patients with POTS than our patients without POTS (Fig 1).
- Headache (61% POTS(+), 47% POTS(-), p=0.2251), peripheral neuropathy (79%, 68%, 0.2747) and GI distress (67%, 49%, 0.1098) are well above 50%.
- Complaints of anxiety (33%, 17%, 0.0809) and concentration issues (30%, 2%, 0.0002) were much more numerous in our patients with POTS.

Conclusions

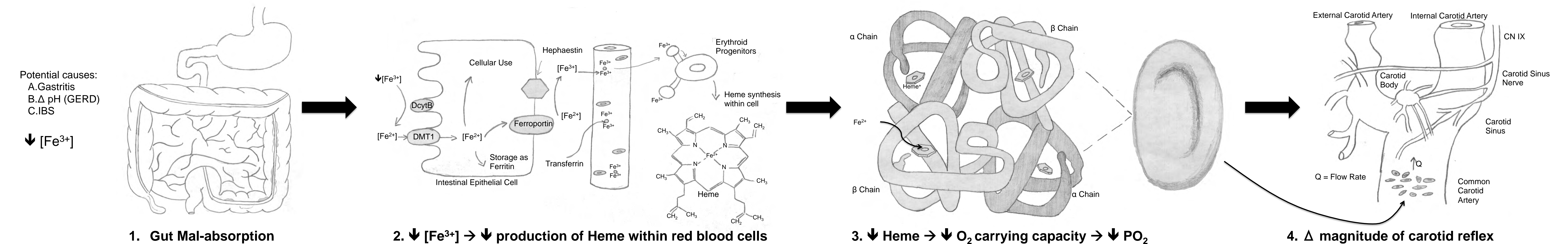
- Female patients with POTS have decreased serum ferritin levels compared to female patients without POTS who may also be suffering from autonomic dysfunction.
- Female patients with serum ferritin below 50ng/mL are 2.8 times more likely to display POTS than females with serum ferritin above 50ng/mL.
- A link between low iron stores and the autonomic dysfunction exhibited in POTS may exist, depicted below.
- POTS patients are likely to exhibit a graded response to the severity of their autonomic dysfunction through an increase in the prevalence of comorbid symptoms, including:
 - headaches.
 - peripheral neuropathy.
 - anxiety.
 - concentration difficulty.
 - GI distress.

Materials and methods

- Medical records of female patients with POTS (n = 33) and without POTS (n = 53) were reviewed for serum ferritin values and the presence of co-morbid conditions.
- All POTS diagnoses required positive tilt-table testing results or head-up tilt (HUT) tests.
- Arithmetic mean serum ferritin values were calculated for both populations; a binomial two-tailed T-test was used to evaluate the statistical significance. Co-morbid conditions were tabulated for both cohorts. Lastly, we noted serum ferritin values <50ng/mL.

Proposed Mechanism

Low iron stores, caused by a gut malabsorption issue (1) play a role in the extreme autonomic dysfunction observed in POTS. This creates a more hypoxic environment (2 & 3) leading to a more extreme and sensitive carotid body reflex (4). This reflex is triggered by a decrease in blood flow rate, resulting from a change in blood pressure, originally caused by a change in posture. Therefore, the observed increase in heart rate in patients with POTS during tilt table tests may be the result of low iron levels in the blood.



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Further information

Contact Daniel Wallman at dwallman@bu.edu or Dr. Anna Depold Hohler at Anna.Hohler@bmc.edu for further information.

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