Phase angle and malnutrition in Canadian community-dwelling adults

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Background:

- Malnutrition remains a significant ongoing issue in Canada.
- Phase angle (PhA) from bioelectric impedance analysis (BIA) may be a surrogate marker for nutritional status.^{1,2,3}
- PhA results are confounded by age, gender, and BMI.² Thus, standardized PhA (SPhA) is a better approach for monitoring.

$$Phase\ angle = arc - tangent \left(\frac{reactance}{resistance} \right) \times \frac{180^\circ}{\pi}$$

Objectives:

- To determine PhA in a sample of Canadian, overweight/obese, community-dwelling adults categorized by age, gender, and BMI.
- To compare PhA of our sample to a reference population matched for age, gender, and BMI.
- To determine if PhA could be improved in response to a nutrition and lifestyle change intervention.

Methods:

- This study is a sub-analysis within the larger NOW Trial (NCT: 03015012).
- Overweight/obese adults attending a lifestyle counselling program in Southwestern Ontario underwent body composition analysis via BIA.
- Phase angle is an output measure given by the device, and varies based on age, gender, and BMI
 - Due to variability in body water, lean tissue, and adipose tissue.
- Participants’ PhA values were matched for age, gender, and BMI to previously published reference values².
- Z-scores were calculated to compare our values to the reference population, then dichotomized into low or average/high SPhA groups depending on distance from the mean (i.e., <-1 SD, or ≥ -1 SD, respectively).
- Statistical analysis included: means±SD, frequencies, independent and paired t-tests, and McNemar’s chi-square.

Results:

Table 1. Baseline and 3 month demographics.

	Baseline			3 Months		
	Females (n = 63)	Males (n = 9)	p	Females (n = 47)	Males (n = 8)	p
Age, yrs	55.0 ± 12.9	56.7 ± 10.5	0.710	58.4 ± 10.6	54.0 ± 12.3	0.382
BMI, kg/m²	36.8 ± 7.2	35.6 ± 6.6	0.627	34.5 ± 6.7	33.8 ± 7.0	0.803
Phase angle, deg	5.3 ± 0.8	5.6 ± 0.6	0.397	5.2 ± 0.7	5.7 ± 0.9	0.03

Table 2. Low and average/high* phase angle matched for age, gender and BMI at baseline and 3 months.

	Baseline			3 Months			McNemar χ²
	Females, n(%)	Males, n(%)	Total, n(%)	Females, n(%)	Males, n(%)	Total, n(%)	P
Low	25(40)	4(44)	29(40)	18(38)	3(38)	21(38)	1.00
Average/High	38(60)	5(56)	43(60)	29(62)	5(62)	34(62)	1.00

*Low defined as measured phase angle < -1 standard deviation from the mean reference value².
Average/High defined as measured phase angle ≥ -1 standard deviation from the mean reference value². Preliminary results, please do not cite.

Conclusions:

- 40% of participants are classified as malnourished at baseline and 38% at three months when using SPhA.
- Three months is likely not enough time to observe changes in PhA with this intervention.
- More research is needed to determine responsiveness of this marker, and is currently ongoing.

Relevance to Practice:

- Objective markers of nutritional status important to dietitians since malnutrition comes in many forms, and influences treatment.
- SPhA provides a safe, reliable, non-invasive biomarker which may aid dietitians in screening and monitoring for malnutrition.

References:

1. Barbosa-Silva et al. *Curr Opin Clin Nutr Metab Care* 2005. 2. Bosty-Westphal et al. *JPEN* 2006. 3. Kyle et al. *Clin Nutr* 2012.