

# The relationship between diet quality and allostatic load among breast cancer survivors

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## 1. Background

- Progress in early detection and treatment of breast cancer (BC) has resulted in rapid increases in the number of BC survivors. How to improve the quality of life for this group of patients becomes increasingly important.
- Allostatic load (AL), a composite score of biomarkers, measures the cumulative bodily wear and tear in response to stress in cancer survivorship. Diet quality affects the quality of life among BC survivors and may be a contributor to AL.

## 2. Purpose

Evaluate the relationship between diet quality and its specific components and AL among BC survivors.

## 3. Methods

- Data and Design:** A cross-sectional analysis using data of BC survivors (n=417) identified from National Health and Nutrition Examination Survey (NHANES) 1999-2010.
- Measures:** AL was defined as the sum of 9 components (1) systolic blood pressure (BP)  $\geq 140$  mmHg (2) diastolic BP  $\geq 90$  mmHg (3) heart rate  $\geq 90$  beats/min (4) total cholesterol level  $\geq 240$  mg/dL (5) high-density lipoprotein (HDL) cholesterol  $< 50$  mg/dL (6) body mass index (BMI)  $\geq 30$  kg<sup>2</sup>/m (7) hemoglobin A1c (HbA1c)  $\geq 6.4\%$  (8) c-reactive protein  $> 3$  mg/L (9) albumin  $< 4$  g/dL. Each cutoff was coded dichotomously. The elevated AL was defined as  $\geq 3$  components. Diet quality was measured by the Healthy Eating Index (HEI) 2010, which scores 12 components (total vegetables, greens and beans, total fruit, whole fruit, total proteins, seafood and plant proteins, whole grains, dairy, fatty acids, refined grains, sodium and empty calories) for a total of 100 points. Higher scores indicate better diet quality.
- Analysis:** Logistic regression was performed with sociodemographic and behavioral covariates adjusted. Survey design effects were accounted in each step of the analysis.

## 4. Results

Table 1 Sample characteristics of adult women with BC diagnosis

Socio-demographics	n (%)	Biomarkers	n (%)
<b>Race</b>		Allostatic load ( $\geq 3$ biomarkers)	91 (23.13)
White	286 (88.19)	Systolic BP $\geq 140$ mmHg	10 (3.38)
Black	71 (8.34)	Diastolic BP $\geq 90$ mmHg	45 (11.90)
Hispanic	50 (3.46)	Heat Rate $\geq 90$ beats	70 (19.80)
<b>Age</b>		Total Cholesterol $\geq 240$ mg/dL	113 (29.52)
<45	25 (8.24)	HDL Cholesterol $< 50$ mg/dL	9 (1.64)
45-64	128 (38.25)	C-reactive protein $> 3$ mg/dL	100 (24.95)
$\geq 65$	264 (53.50)	Albumin $< 4$ g/dL	148 (35.88)
<b>Education</b>		BMI $\geq 30$ kg <sup>2</sup> /m	56 (12.19)
$\leq$ High school	178 (41.12)	HbA1c $\geq 6.4\%$	127 (27.98)
$>$ High school	239 (58.88)	<b>HEI</b>	<b>Mean Score (SD)</b>
<b>Income (PIR1)</b>		Total HEI score (100)	55.21 (0.90)
$< 1.5$	115 (21.15)	Total vegetables (5)	3.52 (0.15)
1.5-4.4	162 (39.88)	Greens and beans (5)	1.45 (0.12)
$\geq 4.5$	140 (38.97)	Total fruit (5)	2.92 (0.12)
<b>Marital status</b>		Non-drinking	180 (43.69)
Unmarried	215 (43.16)	Normal drinking	175 (46.31)
Married	196 (56.84)	Heavy drinking	28 (9.99)
<b>Health insurance</b>		<b>Physical activity</b>	
No	18 (3.86)	Met PAGA2 ( $\geq 150$ min/wk)	116 (39.87)
Yes	399 (96.14)	Unmet PAGA ( $< 150$ min/wk)	143 (60.13)
<b>Smoking</b>		<b>Years since diagnosis</b>	<b>Mean SD</b>
Non-smoker	181 (43.83)		9.58 (0.53)
Smoker	236 (56.17)		
<b>Alcohol drinking</b>			
Non-drinking	180 (43.69)		
Normal drinking	175 (46.31)		
Heavy drinking	28 (9.99)		
<b>Physical activity</b>			
Met PAGA2 ( $\geq 150$ min/wk)	116 (39.87)		
Unmet PAGA ( $< 150$ min/wk)	143 (60.13)		
<b>Years since diagnosis</b>	<b>Mean SD</b>		
	9.58 (0.53)		

Table 2 Univariate analysis of associations between HEI scores and elevated AL

	Odds ratio	(95% CI)
Total HEI score (100)	0.98	(0.96-1.00)*
Total vegetables (5)	0.92	(0.77-1.09)
Greens and beans (5)	0.97	(0.84-1.11)
Total fruit (5)	1.10	(0.96-1.25)
Whole fruit (5)	1.01	(0.89-1.14)
Whole grains (10)	0.94	(0.85-1.03)
Dairy (10)	0.96	(0.89-1.04)
Total proteins (5)	1.03	(0.83-1.29)
Seafood & plant proteins (5)	0.95	(0.82-1.09)
Fatty acids (10)	0.93	(0.86-0.99)*
Sodium (10)	1.00	(0.92-1.09)
Refined grains (10)	0.98	(0.91-1.05)
Empty calories (20)	0.96	(0.92-1.00)

Table 3 Multivariable analysis of association between HEI, fatty acid and elevated

Adjusted odds ratio (95% CI)	Model I (outcome: HEI total)	Model II (outcome: fatty acid score)
<b>HEI total score</b> (effect of unit increase in score)	0.97 (0.95-1.00)*	
<b>Fatty acid score</b> (effect of unit increase in score)		0.87 (0.79-0.95)*
<b>Race</b>		
Black (ref.)	1	1
White	0.21 (0.07-0.66)*	0.27 (0.09-0.82)*
Hispanic	1.17 (0.29-4.63)	1.25 (0.31-5.13)
<b>Age</b>		
<45 (ref.)	1	1
45-64	0.77 (0.19-3.20)	0.84 (0.20-3.53)
$\geq 65$	0.51 (0.11-2.33)	0.63 (0.14-2.77)
<b>Education</b>		
$\leq$ High school (ref.)	1	1
$>$ High school	1.67 (0.88-3.16)	1.69 (0.85-3.35)
<b>Income (PIR)</b>		
$< 1.5$ (ref.)	1	1
1.5-4.4	0.98 (0.34-2.87)	1.23 (0.44-3.41)
$\geq 4.5$	0.42 (0.11-1.68)	0.55 (0.14- 2.15)
<b>Marital status</b>		
Unmarried (ref.)	1	1
Married	0.68 (0.34-1.36)	0.73 (0.35- 1.51)
<b>Health insurance</b>		
No (ref.)	1	1
Yes	0.88 (0.16-4.66)	0.67 (0.14-3.19)
<b>Years since diagnosis</b> (effect of unit increase in years)	1.03 (0.99-1.09)	1.04 (0.99-1.08)
<b>Smoking</b>		
Smoker (ref.)	1	1
Non-smoker	1.31 (0.48-3.59)	1.17 (0.45-3.09)
<b>Alcohol drinking</b>		
Never drinking (ref.)	1	1
Normal drinking	0.59 (0.20-1.72)	0.56 (0.21- 1.54)
Heavy drinking	0.26 (0.03-2.30)	0.25 (0.03-2.46)
<b>Physical activity</b>		
Unmet PAGA (ref.)	1	1
Met PAGA ( $\geq 150$ min/wk)	1.40 (0.69-2.83)	1.38 (0.66-2.90)

<sup>1</sup> PIR: Poverty Income Ratio; <sup>2</sup> PAGA: Physical Activity Guidelines for Americans. Models initially contained all components of HEI; insignificant effects were removed.

## 5. Discussion

The overall diet quality and fat intake are related to AL among BC survivors. Further studies should investigate longitudinal effect of AL on diet quality and subsequent effect of AL on BC survivorship.