

The Association of Serum Chemistry Variables to Active Caries: Analyses of the Third National Health and Nutrition Examination Survey (NHANESIII)

AR Biesbrock* and RD Bartizek
P&G, Mason, OH, USA



0775

ABSTRACT

Objective: This research was conducted to characterize the association of serum chemistry variables with caries activity as measured by the number of decayed coronal surfaces, decayed interproximal surfaces, decayed occlusal surfaces, decayed buccal-lingual surfaces and decayed root surfaces. **Methods:** Stepwise forward regression models were constructed evaluating the association of 15 serum chemistry variables, age, and gender to each of the five measures of caries activity. The regression model was based on 10,145 subjects from NHANESIII that had complete data with respect to serum chemistry and dental caries examinations. **Results:** In all five models, age was statistically significantly ($p < 0.05$) positively correlated to the number of decayed surfaces and disease was more prominent in males. For coronal caries (including decayed coronal surfaces, decayed interproximal surfaces, decayed occlusal surfaces, decayed buccal-lingual surfaces), a statistically significant ($p < 0.05$) positive correlation was observed for blood lead, serum normalized calcium, and serum lactate dehydrogenase concentrations. A statistically significant ($p < 0.05$) negative correlation was observed for blood urea nitrogen, serum albumin, serum iron, serum chloride, and serum total iron binding capacity concentrations. These same statistically significant associations were observed in the root caries regression model. In general, the strongest correlations to caries were observed between 1.) blood lead, 2.) blood urea nitrogen and 3.) serum albumin concentrations in these five models. **Conclusion:** A statistically significant ($p < 0.05$) association exists between a number of serum chemistry variables, including blood lead, serum normalized calcium, serum lactate dehydrogenase, blood urea nitrogen, serum albumin, serum iron, serum chloride, and serum total iron binding capacity concentrations, and the presence of decayed tooth surfaces.

INTRODUCTION AND PURPOSE

Numerous associations have been reported between oral disease and systemic health, including cardiovascular disease, diabetes, and pre-term birth. The oral environment and specifically the composition and function of saliva are influenced by systemic health and potentially reflect changes in serum chemistry. This research was conducted to characterize the association of serum chemistry variables with caries activity as measured by the number of decayed coronal surfaces, decayed interproximal surfaces, decayed occlusal surfaces, decayed buccal-lingual surfaces and decayed root surfaces.

MATERIALS AND METHODS

Stepwise forward regression analysis methods were used to evaluate the association of 15 serum chemistry variables, age, and gender to each of the five measures of caries activity. The tables display the final models, including all variables that met the 0.1500 significance level for entry into the model. The regression model was based on 10,145 subjects from NHANESIII that had complete data with respect to serum chemistry and dental caries examinations.

RESULTS

Table 1: Stepwise Regression for Decayed Coronal Surfaces

Serum Variable*	Correlation	Partial R**2	F statistic	Probability > F
Lead (ug/dL)	Positive	0.0149	152.9584	0.0001
Blood Urea nitrogen (mg/dL)	Negative	0.0030	31.3435	0.0001
Albumin (g/dL)	Negative	0.0027	28.4527	0.0001
TIBC (ug/dL)	Negative	0.0015	15.9285	0.0001
Chloride (mmol/L)	Negative	0.0015	15.4004	0.0001
Iron (ug/dL)	Negative	0.0016	16.3159	0.0001
Normalized calcium (mmol/L)	Positive	0.0010	10.7217	0.0011
Lactate dehydrogenase (U/L)	Positive	0.0010	10.6540	0.0011
Gender		0.0006	6.5643	0.0104
Age group	Positive	0.0005	4.8419	0.0278
Bicarbonate (mmol/L)	Negative	0.0003	2.7145	0.0995
Total calcium (mg/dL)	Positive	0.0003	2.9134	0.0879

Table 2: Stepwise Regression for Decayed Interproximal Surfaces

Serum Variable*	Correlation	Partial R**2	F statistic	Prob. > F
Lead (ug/dL)	Positive	0.0150	154.1540	0.0001
Albumin (g/dL)	Negative	0.0027	28.1520	0.0001
Blood urea nitrogen (mg/dL)	Negative	0.0015	15.9197	0.0001
Age group	Positive	0.0022	23.1930	0.0001
TIBC (ug/dL)	Negative	0.0014	14.7001	0.0001
Normalized calcium (mmol/L)	Positive	0.0011	11.7227	0.0006
Iron (ug/dL)	Negative	0.0011	11.0253	0.0009
Lactate dehydrogenase (U/L)	Positive	0.0009	9.1570	0.0025
Chloride (mmol/L)	Negative	0.0006	5.9129	0.0150
Gender		0.0004	3.6472	0.0562
Total calcium (mg/dL)	Positive	0.0002	2.4097	0.1206
Bicarbonate (mmol/L)	Negative	0.0002	2.3200	0.1277

Table 3: Stepwise Regression for Decayed Occlusal Surfaces

Serum Variable*	Correlation	Partial R**2	F statistic	Prob. > F
Lead (ug/dL)	Positive	0.0141	145.0749	0.0001
Blood Urea nitrogen (mg/dL)	Negative	0.0048	49.6822	0.0001
Iron (ug/dL)	Negative	0.0022	22.3336	0.0001
Albumin (g/dL)	Negative	0.0013	13.8159	0.0002
Hematocrit (%)	Positive	0.0010	15.4004	0.0015
Normalized calcium (mmol/L)	Positive	0.0007	10.1271	0.0056
Lactate dehydrogenase (U/L)	Positive	0.0007	7.6797	0.0089
TIBC (ug/dL)	Negative	0.0005	6.8444	0.0261
Chloride (mmol/L)	Negative	0.0005	5.3741	0.0205
Age group	Negative	0.0005	4.9827	0.0256
Total calcium (mg/dL)	Positive	0.0004	4.6545	0.0310

RESULTS (Cont.)

Table 4: Stepwise Regression for Decayed Buccal-Lingual Surfaces

Serum Variable*	Correlation	Partial R**2	F statistic	Prob. > F
Lead (ug/dL)	Positive	0.0115	117.9113	0.0001
Blood Urea nitrogen (mg/dL)	Negative	0.0032	33.1545	0.0001
Albumin (g/dL)	Negative	0.0029	30.0087	0.0001
TIBC (ug/dL)	Negative	0.0015	15.8592	0.0001
Chloride (mmol/L)	Negative	0.0018	18.4583	0.0001
Iron (ug/dL)	Negative	0.0015	15.1704	0.0001
Gender		0.0011	11.6033	0.0007
Normalized calcium (mmol/L)	Positive	0.0011	11.1365	0.0008
Lactate dehydrogenase (U/L)	Positive	0.0009	9.7629	0.0018
Age group	Positive	0.0006	6.4936	0.0108
Bicarbonate (mmol/L)	Negative	0.0004	3.6846	0.0549

Table 5: Stepwise Regression for Decayed Root Surfaces

Serum Variable*	Correlation	Partial R**2	F statistic	Prob. > F
Age group	Positive	0.0114	116.9237	0.0001
Lead (ug/dl)	Positive	0.0071	72.9544	0.0001
Blood Urea nitrogen (mg/dl)	Negative	0.0016	16.7409	0.0001
Normalized calcium (mmol/L)	Positive	0.0013	13.6665	0.0002
Albumin (g/dl)	Negative	0.0012	12.2305	0.0005
Gender		0.0010	10.1930	0.0014
Iron (ug/dl)	Negative	0.0007	7.2320	0.0072
Lactate dehydrogenase (U/L)	Positive	0.0006	5.7889	0.0161
TIBC (ug/dl)	Negative	0.0005	5.7102	0.0169
Chloride (mmol/L)	Negative	0.0006	5.7839	0.0162

CONCLUSION

A statistically significant ($p < 0.05$) association exists between a number of serum chemistry variables, including blood lead, serum normalized calcium, serum lactate dehydrogenase, blood urea nitrogen, serum albumin, serum iron, serum chloride, and serum total iron binding capacity concentrations, and the presence of decayed tooth surfaces.