An Apple or Onion a Day Keeps the Doctor Away: Association of Dietary Quercetin With Less Acute Respiratory Illness and Chronic Cough (Road to Health Study)

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RATIONALE: Quercetin, a flavonoid abundant in onions and apples, has synergistic antiviral and immunomodulatory activities. More specifically it inhibits secretion of histamine, pro-inflammatory interleukin-8, and tumor necrosis factor. The aim of this study was to examine the association of frequency of onion and apple consumption with the incidence of acute respiratory illness and chronic cough.METHODS: Cross-sectional data from the National Health and Nutrition Examination Survey 2003-2004 were retrospectively examined. Two items from a food frequency questionnaire measured the frequency of consumption of apples and onions in the previous 12 months. Multivariate adjusted logistic regressions were used to analyze the association of apple and onion diet frequency with reported incidence of acute respiratory illness and chronic cough. We estimated odds ratios (ORs) and 95% confidence intervals (CIs). Significance was set at $p<0.05$.RESULTS: Participants were children and adults (n= 8,476). 479 (7.9%) reported never eating apples, while 1,190 (20%) reported never eating onions. At least daily onion consumption resulted in 1.42 greater odds of not having a head or chest cold (95% CI:[1.03,1.95];p=0.03) compared with never eating onions. Mexican American and Other Hispanic participants had increased odds of reporting a head or chest cold;$p\leq0.004$. There was no association of eating apples with having a head or chest cold ($p>0.07$). Occasional apple consumption was associated with 1.6 greater odds of not having flu, pneumonia, or an ear infection (OR:1.60;95% CI:[1.01,2.54]; p=0.04) compared with never eating apples. Eating onions at any frequency reduced the odds of flu, pneumonia, or ear infection; $p\leq0.007$. Daily or more frequent consumption of onions was associated with 2.5 increased odds of not having the flu, pneumonia, or ear infections (OR:2.50;95% CI:[1.39,4.46]; p=0.002). In participants 12 years or older with a history of wheezing (n=865), occasional or more frequent apple consumption significantly reduced the odds of a chronic cough ($p\leq0.04$) compared to no consumption. At least daily apple consumption was associated with 5.3 greater odds of not reporting a chronic cough (OR:5.32;95% CI:[1.37,20.61];p=0.02) compared to non-apple eaters. In contrast, there was no association of onion consumption with reduced chronic cough ($p>0.20$). Stress (reduced mental health) was positively associated with, and slightly increased the odds, of flu, pneumonia, ear infections, and chronic cough, $p\leq0.001$, Table 1. CONCLUSION: Quercetin, a key component of the Mediterranean diet, may be a biologically plausible therapeutic to prevent/treat acute respiratory illness and chronic cough but translational research is needed to define the causal role of dietary quercetin.

Table 1. Adjusted ORs for having acute respiratory illness (head or chest cold and flu, pneumonia, or ear infection) or chronic cough.

Variable		Head cold or chest cold that started during past 30 days	Did you have flu, pneumonia, or ear infections that started during those 30 days?	Usually coughs on most days for 3 consecutive months or more during the year
		HSQ500, n = 8,476	HSQ520, n = 8,472	RDQ031, n = 865
	N	Adjusted OR* [95% CI]		
Apple Intake				
Never	479 (7.9%)	Reference	Reference	Reference
Rarely	2052 (34%)	1.085 [0.840 1.400] / 0.532	1.403 [0.899, 2.190] / 0.136	1.441 [0.790, 2.628] / 0.234
Occasionally	2324 (38%)	1.269 [0.978 1.647] / 0.073	1.604 [1.014, 2.537] / 0.044	1.975 [1.028, 3.794] / 0.041
Frequently	887 (15%)	1.340 [0.982 1.829] / 0.065	1.258 [0.738, 2.145] / 0.400	2.732 [1.178, 6.336] / 0.019
Daily or more frequently	332 (5.5%)	1.321 [0.882 1.978] / 0.177	0.925 [0.489, 1.750] / 0.810	5.315 [1.371, 20.606] / 0.016
	2402 (missing)			
Onion Intake				
Never	1190 (20%)	Reference	Reference	Reference
Rarely	1033 (17%)	1.128 [0.880, 1.445] / 0.341	1.824 [1.177, 2.825] / 0.007	0.887 [0.397, 1.983] / 0.770
Occasionally	1892 (31%)	1.201 [0.959, 1.504] / 0.110	2.136 [1.443, 3.162] / 0.000	0.620 [0.296, 1.296] / 0.204
Frequently	1435 (24%)	1.102 [0.870, 1.396] / 0.422	2.010 [1.327, 3.045] / 0.001	0.790 [0.367, 1.703] / 0.548
Daily or more frequently	524 (8.6%)	1.415 [1.029, 1.947] / 0.033	2.495 [1.394, 4.464] / 0.002	0.598 [0.240, 1.486] / 0.268
	2402 (missing)			
Gender				
Male	4169 (49%)	Reference	Reference	Reference
Female	4307 (51%)	0.884 [0.764, 1.022] / 0.095	0.768 [0.582, 1.012] / 0.061	0.946 [0.639, 1.399] / 0.781
Age				
<18 years	3637 (43%)	Reference	Reference	Reference
18 years or older	4839 (57%)	1.005 [0.840, 1.203] / 0.957	0.931 [0.664, 1.306] / 0.680	0.592 [0.330, 1.063] / 0.079
Race/Ethnicity				
Non-Hispanic White	3499 (41%)	Reference	Reference	Reference
Mexican American	2095 (25%)	0.732 [0.607 0.882] / 0.001	0.728 [0.519, 1.021] / 0.066	1.919 [1.084, 3.396] / 0.025
Other Hispanic	266 (3.1%)	0.558 [0.375 0.831] / 0.004	1.217 [0.484, 3.062] / 0.677	1.103 [0.400, 3.037] / 0.850
Non-Hispanic Black	2261 (27%)	0.834 [0.694 1.004] / 0.055	1.214 [0.836, 1.764] / 0.309	3.294 [1.863, 5.824] / 0.000
Other Race - Including Multi-Racial	355 (4.2%)	0.941 [0.634 1.396] / 0.763	0.555 [0.302, 1.019] / 0.058	1.529 [0.518, 4.520] / 0.442
Stress (HSQ480) number of days mental health was not good	6424 (75.8%)	0.993 [0.984 1.003] / 0.168	0.973 [0.959, 0.988] / 0.000	0.960 [0.941, 0.980] / <0.001

Note. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated for each risk group.

Logistic regression was used to estimate odds ratios (ORs), as measures of relative risk, and corresponding 95% confidence intervals (CIs).

*Multivariate odds ratios (OR) and 95% confidence intervals (CI), adjusted for the covariates (gender, age, race, ethnicity, and stress ("number of days mental health was not good").

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