

Association Between Ultra-Processed Food Consumption And Risk Of Colorectal Cancer Precursors In Three US Cohorts

Abstract 116

Background: Growing evidence indicates the adverse effect of ultra-processed food (UPF) consumption. However, it remains unknown whether ultra-processed food consumption influences the risk of colorectal cancer precursors, namely conventional adenomas and serrated lesions.

Methods: We drew data from the Nurses' Health Study (NHS), NHS2, and Health Professionals Follow-up Study (HPFS), comprising 144,881 participants who had undergone at least one lower gastrointestinal endoscopy since baseline and were followed until the diagnosis of conventional adenomas or serrated lesions. We assessed the intake of UPFs according to the NOVA classification based on the validated food frequency questionnaires administered every 4 years. To handle multiple records per participants and time-varying exposures, we used multivariable logistic regression for clustered data to calculate odds ratios (OR) and 95% confidence intervals (CIs) for cumulative average consumption of UPFs and colorectal polyps.

Results: We documented 11,972 cases with conventional adenomas and 10,710 with serrated lesions during 18-20 years of follow up. Compared to participants in the lowest quintile of UPF consumption, those in the highest quintile had an increased risk of conventional adenomas (OR=1.19, 95% CI: 1.12-1.27; P trend <.0001) and serrated lesions (OR=1.22, 95% CI: 1.14-1.30; P trend <.0001). Similar results were found for high-risk polyps (i.e., advanced adenomas and ≥ 10 mm serrated lesions; OR=1.19, 95% CI: 1.09-1.30; P trend <.0001). These associations were slightly attenuated but remained statistically significant after further adjusting for body mass index, western dietary pattern score, or individual dietary factors (fiber, folate, calcium, and vitamin D). The results remained essentially unchanged after we excluded processed meat from total UPF intake. Among different UPF subgroups, meat/poultry/seafood-based ready-to-eat products showed the strongest association with high-risk polyps (OR per one serving per day=1.17, 95% CI: 1.06-1.29), followed by packaged sweet snacks and desserts (OR=1.05, 95% CI: 1.02-1.08), and fat, condiment, and sauces (OR=1.05, 95%: 1.03-1.08).

Conclusion: Higher consumption of ultra-processed foods is associated with an increased risk of colorectal cancer precursors. The association does not appear to be driven by processed meat. Ultra-processed foods might be a modifiable target for early prevention of colorectal cancer.

Table 1. Association between ultra-processed food consumption and risk of conventional adenomas and serrated lesions in the three cohort studies (NHS, NHS2, HPFS)

	Energy adjusted servings per day of UPF intake, OR (95% CI) ^a					<i>P</i> for trend ^b	OR (95% CI) per 5 servings per day
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5		
Median intake	4.0	5.2	6.2	7.4	9.4		
Conventional adenomas							
Cases	2083	2355	2437	2611	2486		11,972
Model 1	1 (ref)	1.04 (0.98-1.11)	1.09 (1.03-1.16)	1.20 (1.13-1.27)	1.21 (1.14-1.29)	<.0001	1.18 (1.14-1.23)
Model 2	1 (ref)	1.04 (0.98-1.10)	1.09 (1.02-1.15)	1.19 (1.12-1.26)	1.19 (1.12-1.27)	<.0001	1.17 (1.12-1.21)
Model 2+BMI	1 (ref)	1.03 (0.97-1.10)	1.07 (1.01-1.14)	1.17 (1.10-1.24)	1.17 (1.10-1.24)	<.0001	1.15 (1.10-1.20)
Model 2+western dietary pattern score	1 (ref)	1.02 (0.95-1.08)	1.05 (0.99-1.12)	1.14 (1.07-1.21)	1.13 (1.06-1.21)	<.0001	1.12 (1.08-1.17)
Model 2+dietary fiber, folate, calcium and vitamin D	1 (ref)	1.03 (0.96-1.09)	1.07 (1.00-1.14)	1.17 (1.10-1.24)	1.17 (1.10-1.25)	<.0001	1.15 (1.11-1.20)
Serrated lesions							
Cases	1824	2099	2226	2307	2254		10,710
Model 1	1 (ref)	1.05 (0.99-1.12)	1.13 (1.06-1.20)	1.20 (1.13-1.28)	1.25 (1.17-1.33)	<.0001	1.21 (1.16-1.26)
Model 2	1 (ref)	1.06 (0.99-1.13)	1.14 (1.07-1.21)	1.20 (1.12-1.27)	1.22 (1.14-1.30)	<.0001	1.17 (1.13-1.22)
Model 2+BMI	1 (ref)	1.04 (0.98-1.11)	1.11 (1.04-1.19)	1.16 (1.09-1.24)	1.17 (1.10-1.25)	<.0001	1.14 (1.09-1.19)
Model 2+western dietary pattern score	1 (ref)	1.03 (0.97-1.10)	1.10 (1.03-1.17)	1.14 (1.07-1.22)	1.15 (1.08-1.23)	<.0001	1.14 (1.09-1.19)
Model 2+dietary fiber, folate, calcium and vitamin D	1 (ref)	1.04 (0.97-1.11)	1.11 (1.04-1.19)	1.17 (1.10-1.25)	1.20 (1.12-1.28)	<.0001	1.16 (1.11-1.21)

Abbreviations: NHS, Nurses' Health Study; NHS2, Nurses' Health Study 2; HPFS, Health Professionals Follow-up Study; UPF, ultra-processed food; OR, odds ratio; 95% CI, 95% confidence interval; BMI, body mass index.

^a Model 1 was adjusted for age (years), race (Caucasian or non-Caucasian), cohort (NHS, NHS2, or HPFS), time period of endoscopy (in 2-year intervals), number of prior endoscopies (continuous), and time in years since the most recent endoscopy (continuous).

Model 2 was further adjusted for family history of colorectal cancer (yes or no), total alcohol intake (in g/day, <5, 5-10, 10-15, 15-30, or ≥30), physical activity (in metabolic equivalent-hours/week; <3, 3-9, 9-18, 18-27, or ≥27), smoking status and pack-years of smoking (never, past smoker with pack-years <5, past smoker with pack-years ≥5, current smoker with pack-years <20, current smoker with pack-years ≥20), regular aspirin use (yes or no), and additionally for menopausal status (yes or no) and postmenopausal hormone use (never or ever) in women.

The other models were further adjusted for BMI (continuous), western dietary pattern score (continuous), or individual dietary factors (quintiles), respectively.

^b *P* value for linear trend was obtained by using the median intake in each quintile as a continuous variable, adjusted for the same set of covariates as above.

Table 2. Association between ultra-processed food consumption and risk of colorectal polyps according to polyp features in the three cohort studies (NHS, NHS2, HPFS)^a

	Energy adjusted servings per day of UPF intake, OR (95% CI) ^a					<i>P</i> for trend ^b	OR (95% CI) per 5 servings per day	<i>P</i> for heterogeneity ^c
	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5			
Median intake	4.0	5.2	6.2	7.4	9.4			
Anatomic subsite								
Proximal colon								
Cases	1608	1750	1872	1899	1842		8971	
Model 1	1 (ref)	1.00 (0.93-1.07)	1.08 (1.01-1.16)	1.12 (1.05-1.20)	1.16 (1.09-1.24)	<.0001	1.16 (1.11-1.21)	
Model 2	1 (ref)	0.99 (0.93-1.07)	1.08 (1.01-1.15)	1.12 (1.04-1.20)	1.15 (1.07-1.23)	<.0001	1.15 (1.10-1.20)	
Distal colon								
Cases	1697	1934	2041	2207	2151		10,030	
Model 1	1 (ref)	1.05 (0.98-1.12)	1.12 (1.05-1.20)	1.24 (1.16-1.33)	1.28 (1.20-1.37)	<.0001	1.24 (1.19-1.29)	0.03
Model 2	1 (ref)	1.05 (0.98-1.12)	1.12 (1.05-1.20)	1.23 (1.15-1.31)	1.24 (1.16-1.33)	<.0001	1.20 (1.15-1.25)	0.11
Rectum								
Cases	978	1138	1133	1212	1172		5633	
Model 1	1 (ref)	1.06 (0.97-1.16)	1.07 (0.98-1.17)	1.17 (1.08-1.28)	1.20 (1.11-1.31)	<.0001	1.18 (1.11-1.25)	0.83
Model 2	1 (ref)	1.07 (0.98-1.17)	1.08 (0.99-1.17)	1.17 (1.07-1.27)	1.17 (1.07-1.27)	<.0001	1.14 (1.08-1.21)	0.57
Feature								
High-risk polyps^d								
Cases	915	976	1088	1145	1102		5226	
Model 1	1 (ref)	0.99 (0.90-1.08)	1.11 (1.02-1.22)	1.20 (1.10-1.31)	1.22 (1.11-1.33)	<.0001	1.20 (1.13-1.27)	
Model 2	1 (ref)	0.99 (0.90-1.08)	1.11 (1.01-1.21)	1.19 (1.09-1.30)	1.19 (1.09-1.30)	<.0001	1.18 (1.11-1.25)	
Low-risk polyps								
Cases	2657	3044	3132	3306	3201		15,340	
Model 1	1 (ref)	1.05 (0.99-1.11)	1.09 (1.04-1.15)	1.18 (1.12-1.25)	1.22 (1.16-1.29)	<.0001	1.19 (1.15-1.24)	0.86
Model 2	1 (ref)	1.05 (0.99-1.11)	1.09 (1.03-1.15)	1.18 (1.11-1.24)	1.20 (1.14-1.27)	<.0001	1.17 (1.13-1.21)	0.80

Abbreviations: NHS, Nurses' Health Study; NHS2, Nurses' Health Study 2; HPFS, Health Professionals Follow-up Study; UPF, ultra-processed food; OR, odds ratio; 95% CI, 95% confidence interval.

^a Model 1 was adjusted for age (years), race (Caucasian or non-Caucasian), cohort (NHS, NHS2, or HPFS), time period of endoscopy (in 2-year intervals), number of prior endoscopies (continuous), and time in years since the most recent endoscopy (continuous).

Model 2 was further adjusted for family history of colorectal cancer (yes or no), total alcohol intake (in g/day, <5, 5-10, 10-15, 15-30, or ≥30), physical activity (in metabolic equivalent-hours/week; <3, 3-9, 9-18, 18-27, or ≥27), smoking status and pack-years of smoking (never, past smoker with pack-years <5, past smoker with pack-years ≥5, current smoker with pack-years <20, current smoker with pack-years ≥20), regular aspirin use (yes or no), and additionally for menopausal status (yes or no) and postmenopausal hormone use (never or ever) in women.

^b *P* value for linear trend of polyp risk across quintiles of ultra-processed food consumption was obtained by assigning the quintile medians to each participant in the quintile as an ordinal variable, adjusted for the same set of covariates as above.

^c *P* for heterogeneity was calculated through case-only analysis (distal colon / rectum vs. proximal colon; high-risk vs. low-risk).

^d High risk polyps included advanced conventional adenomas (defined as at least one adenoma of ≥10 mm in diameter or any size with tubulovillous, villous, or high-grade dysplasia) and large serrated lesions (≥10 mm).

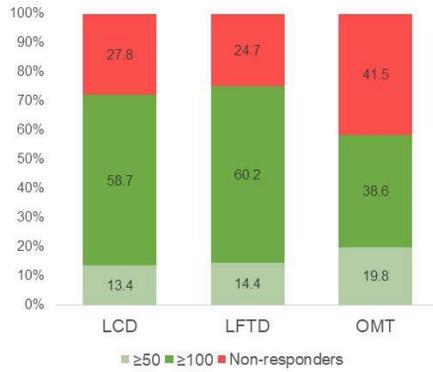


Figure. Proportion of participants with a score reduction in IBS-SSS with ≥ 50 , ≥ 100 , and non-responders in low carbohydrate diet (LCD), low FODMAP+traditional IBS diet (LFTD) and optimized medical treatment (OMT).