# Regular use of aspirin or acetaminophen and risk of brain tumors

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## Introduction

Regular use of aspirin and other non-steroidal anti-inflammatory drugs (NSAIDs) has been hypothesized to be associated with reduced risk of cancer, although few studies have examined associations with brain tumor risk.

## Methods

The current study investigated the effects of regular aspirin or acetaminophen use on brain tumor risk among 176 individuals with primary, incident brain tumors and 704 age and sex matched hospital controls with non-neoplastic conditions who completed a comprehensive epidemiologic questionnaire.

**Table 1 - Characteristics of 176 Brain Tumor Cases and 704 Hospital Controls at RPCI, 1982-1998**

| Characteristic | Cases n (%) | Controls n (%) | p[1] |
|---|---|---|---|
| Male | 104 (59.1) | 416 (59.1) | 1 |
| Non-Hispanic White race | 168 (95.5) | 692 (98.3) | 0.02 |
| Currently married | 126 (72.4) | 460 (65.6) | 0.09 |
| High school graduate | 140 (80.5) | 570 (81.9) | 0.66 |
| Yearly income > $25,000 | 80 (46.8) | 269 (38.5) | 0.05 |
| First degree relative with brain tumor | 3 (1.7) | 13 (1.8) | 0.9 |
| Tobacco smoking status | | | |
| Never smoker | 97 (55.1) | 286 (40.7) | |
| Former smoker | 62 (35.2) | 248 (35.3) | |
| Current smoker | 17 (9.7) | 168 (23.9) | <0.001 |
| Consumes >14 alcohol beverages per week | 12 (6.8) | 88 (12.5) | 0.03 |
| Known occupational exposure to radiation | 18 (13.0) | 54 (9.0) | 0.15 |
| Known occupational exposure to pesticiden | 17 (40.5) | 68 (46.6) | 0.48 |
| Known occupational exposure to asbestos | 34 (29.1) | 113 (24.6) | 0.33 |
| Known occupational exposure to wood dust | 23 (16.7) | 120 (19.7) | 0.41 |
| Known occupational exposure to coal dust | 22 (16.2) | 99 (16.3) | 0.98 |
| Known occupational exposure to other dust | 37 (26.4) | 200 (33.7) | 0.1 |
| Known occupational exposure to smoke | 29 (21.5) | 144 (23.6) | 0.6 |
| | Mean (SD) | Mean (SD) | p[1] |
| Age | 49.2 (17.4) | 49.2 (17.1) | 0.99 |
| Year completed questionnaire | 1990 (4.7) | 1987 (3.8) | <0.001 |
| Usual Body Mass Index (kg/m$^2$) | 26.0 (5.0) | 25.5 (4.3) | 0.22 |
| Usual daily exposure to second hand smoke (hours) | 3.8 (5.3) | 5.5 (6.2) | 0.001 |

**Table 2 - Crude and Adjusted Associations Between Regular Aspirin Use and Brain Tumor Risk, Stratified by Gender**

| | Cases n (%) | Controls n (%) | Crude OR (95% CI) |
|---|---|---|---|
| | MEN | | |
| **Regular aspirin user** | | | |
| No2 | 66 (63.5) | 230 (55.3) | Reference |
| Yes3 | 38 (36.5) | 186 (44.7) | 0.71 (0.46-1.11) |
| **Frequency of aspirin use[4]** | | | |
| Used 1-6 times/week | 19 (18.3) | 119 (28.6) | 0.56 (0.32-0.97) |
| Used 7+ times/week | 19 (18.3) | 67 (16.1) | 0.99 (0.55-1.76) |
| **Duration of aspirin use[4]** | | | |
| Used for 1-10 years | 21 (20.2) | 99 (23.8) | 0.74 (0.43-1.27) |
| Used for >10 years | 17 (16.3) | 87 (20.9) | 0.68 (0.38-1.23) |
| **Cumulative aspirin use[4,5]** | | | |
| Moderate use (≤10 tablet-yrs) | 28 (26.9) | 155 (37.3) | 0.63 (0.39-1.02) |
| High use (>10 tablet-yrs) | 10 (9.6) | 31 (7.5) | 1.12 (0.52-2.41) |
| | WOMEN | | |
| **Regular aspirin user** | | | |
| No2 | 42 (58.3) | 164 (56.9) | Reference |
| Yes3 | 30 (41.7) | 124 (43.1) | 0.95 (0.56-1.59) |
| **Frequency of aspirin use[4]** | | | |
| Used 1-6 times/week | 25 (34.7) | 96 (33.3) | 1.02 (0.58-1.77) |
| Used 7+ times/week | 5 (6.9) | 28 (9.7) | 0.70 (0.25-1.92) |
| **Duration of aspirin use[4]** | | | |

## Results

Results indicate that regular aspirin use may be associated with decreased brain tumor risk among men [adjusted odds ratio (aOR) 0.63, 95% confidence interval (CI) 0.40–1.01], but not among women (aOR 1.13, 95% CI 0.65–1.95). Similarly, regular acetaminophen use may have been associated with decreased risk among men (aOR 0.58, 95% CI 0.26-1.29), with the most pronounced effect noted for men who had used acetaminophen regularly for more than 10 years (aOR 0.10, 95% CI 0.01-0.79).

## Conclusions

Based on these results, Aspirin may have a chemoprotective or anti-gliomagenesis effect with regard to brain tumors, indicating the need for further investigation in both basic sciences and larger clinical studies.

## Learning Objectives

Based on this session, participants should be aware of the possibility that basic medications such as NSAIDs, specifically aspirin, have a potential anti-gliomagenesis effect.

**Table 3 - Crude and Adjusted Associations Between Acetaminophen Use and Brain Tumor Risk, Stratified by Gender**

| | Cases n (%) | Controls n (%) | Crude OR (95% CI) | Adjusted OR[1] (95% CI) | P for trend |
|---|---|---|---|---|---|
| | MEN | | | | |
| **Regular acetaminophen user** | | | | | |
| No2 | 78 (86.7) | 352 (91.4) | Reference | Reference | |
| Yes3 | 12 (13.3) | 33 (8.6) | 1.64 (0.81-3.32) | 0.58 (0.26-1.29) | |
| **Frequency of acetaminophen use[4]** | | | | | |
| Used 1-6 times/week | 8 (8.9) | 30 (7.8) | 1.20 (0.53-2.73) | 0.40 (0.16-1.00) | |
| Used 7+ times/week | 4 (4.4) | 3 (0.8) | 6.02 (1.32-27.4) | 3.36 (0.54-20.9) | 0.57 |
| **Duration of acetaminophen use[4]** | | | | | |
| Used for 1-10 years | 11 (12.2) | 17 (4.4) | 2.92 (1.32-6.48) | 1.03 (0.42-2.55) | |
| Used for >10 years | 1 (1.1) | 16 (4.2) | 0.28 (0.04-2.16) | 0.10 (0.01-0.79) | 0.04 |
| **Cumulative acetaminophen use[4,5]** | | | | | |
| Moderate use (≤10 tablet-yrs) | 11 (12.2) | 28 (7.3) | 1.77 (0.85-3.71) | 0.62 (0.27-1.45) | |
| High use (>10 tablet-yrs) | 1 (1.1) | 5 (1.3) | 0.90 (0.10-7.83) | 0.33 (0.04-3.10) | 0.16 |
| | WOMEN | | | | |
| **Regular acetaminophen user** | | | | | |
| No2 | 56 (81.2) | 244 (88.1) | Reference | Reference | |
| Yes3 | 13 (18.8) | 33 (11.9) | 1.72 (0.85-3.47) | 0.96 (0.43-2.15) | |
| **Frequency of acetaminophen use[4]** | | | | | |
| Used 1-6 times/week | 13 (18.8) | 25 (9.0) | 2.27 (1.09-4.70) | 1.26 (0.56-2.87) | |
| Used 7+ times/week | 0 | 8 (2.9) | 0.003 (0-108) | 0.001 (0-108) | 0.42 |
| **Duration of acetaminophen use[4]** | | | | | |
| Used for 1-10 years | 7 (10.1) | 20 (7.2) | 1.53 (0.62-3.78) | 0.91 (0.34-2.48) | |
| Used for >10 years | 6 (8.7) | 13 (4.7) | 2.01 (0.73-5.52) | 1.03 (0.35-3.10) | 0.99 |
| **Cumulative acetaminophen use[4,5]** | | | | | |
| Moderate use (≤10 tablet-yrs) | 11 (15.9) | 24 (8.7) | 2.00 (0.92-4.32) | 1.15 (0.48-2.72) | |
| High use (>10 tablet-yrs) | 2 (2.9) | 9 (3.2) | 0.97 (0.20-4.61) | 0.50 (0.10-2.60) | 0.66 |

## References

1. Kyritsis AP, Saya H: Epidemiology, cytogenetics, and molecular biology of brain tumors. Curr Opin Oncol 5:474-480, 1993
2. McKinley B, Michalek AM, Fenstermaker RA, Plunkett RJ: The impact of age and sex on the incidence of glial tumors in New York State from 1976 to 1995. J Neurosurg, 93(6):932-939, 2000.
3. Kuratsu J, Ushio Y: Epidemiological study of primary intracranial tumors: a regional survey in Kumamoto Prefecture in the southern part of Japan. J Neurosurg 84:946-950, 1996.
4. Inskip PD, Linet MS, Heineman EF: Etiology of brain tumors in adults. Epidemiol Rev 17:382-414, 1995.
5. Fleury A, Menegoz F, Grosclaude P, et al: Descriptive epidemiology of cerebral gliomas in France. Cancer 79:1195-1202, 1997.
6. Walker AE, Robins M, Weinfeld FD: Epidemiology of brain tumors: the national survey of intracranial neoplasms. Neurology 35:219-226, 1985.
7. Wrensch M, Bondy ML, Weincke J, et al: Environmental risk factors for primary malignant brain tumors: a review. J Neuro-Oncology 17:47-64, 1993.