

Oral Contraceptive Use is Associated with Allergic Rhinitis

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Background

- Allergic rhinitis (AR) is an inflammatory-driven process that varies in prevalence and severity between sexes,¹ suggesting a potential hormonal influence.
- In different parts of the body, it has been implicated that estrogen has both pro and anti-inflammatory effects.^{2,3}
- Studies have also shown an influence of female sex hormones on inflammatory processes, including asthma.⁴
- Most oral contraceptives (OCPs) contain estrogen.

Objective: This cross-sectional study aims to examine the association between OCP use and AR in females.

Methods

- Data from the National Health and Nutrition Examination Survey (NHANES) 2005-2006, 2007-2008, and 2009-2010 cycles⁵ were used.
- Inclusion criteria were female sex at birth, 20-40 years old.
- Exclusion criteria were being pregnant, having ovary(ies) removed, menopause.
- Both bivariate and multivariate logistic regression analyses were conducted
- Forwards selection was used to determine the final model for the multivariate analysis.
- The covariates age, race/ethnicity, and family Poverty-Income Ratio (PIR) were always included in the model.
- We used complete case analysis to handle missing data.

Table 1: Baseline Descriptive Statistics and Bivariate Analysis Stratified by Current OCP Use

Covariates/Outcome Variables	Overall 4,005 44,336,003	Taking OCPs Now (Yes) 512 8,339,392	Taking OCPs Now (No) 3,493 35,996,641	p-value
Age	25 (18, 33)	26 (21, 31)	25 (18, 33)	0.004*
Race/Ethnicity				<0.001*
White	1,432	303 (24%)	1,129 (76%)	
Other Hispanic	376	34 (10%)	342 (90%)	
Mexican American	985	74 (10%)	911 (90%)	
Non-Hispanic Black	994	86 (10%)	908 (90%)	
Other Race Including Multi-Racial	218	15 (9%)	203 (91%)	
Family PIR	2.51 (1.20, 4.25)	3.57 (1.60, 5.00)	2.33 (1.16, 4.01)	<0.001
Language of SP Interview				<0.001*
English	3,474	475 (19%)	2,999 (81%)	
Spanish	531	37 (10%)	494 (90%)	
Had At Least 12 Alcohol Drinks in 1 Yr				<0.001*
Yes	1,456	287 (25%)	1,169 (75%)	
No	646	76 (14%)	570 (86%)	
Episode of Hay Fever in Past 12 Months				0.2
Yes	351	60 (22%)	291 (78%)	
No	3,642	452 (19%)	3,190 (81%)	

p < 0.05 was considered significant, indicated by *, calculated using chi-square or t-test, as appropriate.

For the first row, unweighted and weighted numbers are listed.

For the remaining rows, unweighted numbers and weighted percentages, n (%), or median (IQR) are listed.

Weighted percentages were used to calculate p-values.

Table 2: Adjusted Association of Current OCP Use and Episode of Hay Fever in Past 12 Months

Variable	OR (95% CI)	P-value
Taking OCPs Now (Yes vs. No)	1.13 (0.76-1.69)	0.536
Exam Age in Months	1.08* (1.05-1.10)	<0.001*
Race/Ethnicity		
White (ref)	-	-
Other Hispanic	0.87 (0.44-1.70)	0.679
Mexican American	0.36* (0.20-0.65)	<0.001*
Non-Hispanic Black	0.78 (0.54-1.12)	0.189
Other Race Including Multi-Racial	0.92 (0.47-1.81)	0.820
Family PIR	1.04 (0.97-1.12)	0.299
Had At Least 12 Alcohol Drinks in 1 Yr	1.85* (1.34-2.56)	<0.001*

Odds ratios are adjusted for all variables listed in the table.

Analysis employs forwards selection for model determination, with age, race, and PIR forced in.

Table 3: Adjusted Association of Duration of OCP Use and Episode of Hay Fever in Past 12 Months

Variable	OR (95% CI)	P-value
How Long Taking OCPs	1.05* (1.01-1.09)	0.016*
Exam Age in Months	1.07* (1.03-1.10)	<0.001*
Race/Ethnicity		
White (ref)	-	-
Other Hispanic	0.80 (0.39-1.67)	0.560
Mexican American	0.30* (0.16-0.59)	<0.001*
Non-Hispanic Black	0.89 (0.59-1.35)	0.589
Other Race Including Multi-Racial	1.23 (0.57-2.65)	0.610
Family PIR	1.04 (0.95-1.15)	0.370
Had At Least 12 Alcohol Drinks in 1 Yr	1.52* (1.04-2.23)	0.036*

RESULTS

Current OCP Use and Hay Fever:

- Women currently using OCPs had an odds ratio (OR) of 1.13 for hay fever compared to non-users, though this was not statistically significant (95% CI: 0.76-1.69, p=0.536).
- Age was significantly associated with hay fever, with an OR of 1.08 (95% CI: 1.05-1.10, p<0.001).
- Race/ethnicity showed significant associations, with Mexican Americans having significantly lower odds of hay fever (OR: 0.36, 95% CI: 0.20-0.65, p<0.001).

Duration of OCP Use and Hay Fever:

- The mean and SD for OCP use duration were 4.5 years and 4.6 years, respectively.
- Longer duration of OCP use was associated with increased odds of hay fever (OR: 1.05, 95% CI: 1.01-1.09, p=0.016).
- Exam age in months was again a significant factor (OR: 1.07, 95% CI: 1.03-1.10, p<0.001).
- Mexican Americans continued to show significantly lower odds (OR: 0.30, 95% CI: 0.16-0.59, p<0.001).

CONCLUSION

- Our study demonstrates that longer duration of OCP use, a prevalent birth control method that modifies endogenous estrogen levels, is associated with higher prevalence of AR.
- These findings contribute to the growing body of research that suggests that hormonal influences may contribute to sex-specific disease prevalence.⁴
- This study is limited by its cross-sectional design, which precludes establishing causality and the self-reported data on OCP use and allergic conditions.
- Further longitudinal studies are needed to explore the mechanisms underlying the observed association and to determine whether OCP-induced hormonal changes directly influence the immune response leading to allergies.

References

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