Paternal tobacco smoking and the risk of ADHD in children: A meta-analysis

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Paternal smoking was associated with a 22% increased risk of ADHD in children (RR=1.22, 95% CI: 1.12, 1.33). Maternal smoking may confound the observed association.

BACKGROUND

• Attention-deficit/hyperactivity disorder (ADHD) is the most common childhood-onset neurodevelopmental disorder.

RESULTS CONTINUED

Poster

number

- Its global prevalence is 3.1% in adults and 8% in children and adolescents.
- No single known cause for ADHD both genetic and environmental factors contribute to its development.
- Smoking rates are higher among men than women worldwide (36.7% vs. 7.8%).
- The association between paternal smoking and ADHD in offspring is not yet well established.

METHODS

- We used a systematic review and meta-analysis methods.
- Both conventional and cumulative meta-analyses were conducted.
- CINAHL, Embase, PsycINFO, PubMed, Scopus, and Web of Science were systematically searched from inception until 15 March 2024.
- Pooled odds ratios with 95% confidence intervals (CIs) were calculated \bullet using a random-effects model.
- Heterogeneity among studies was assessed using the I² test. \bullet
- Publication bias and small study effects were evaluated using funnel plots \bullet and Egger's test.
- Sensitivity and subgroup analyses were also performed.

Study						with 95% CI	(%)
Altink et al., 2009					_ ·	1.75 [0.97, 3.16]	1.75
Biederman et al., 2020					_ ·	1.79 [0.99, 3.23]	1.75
Brion et al., 2010a						1.03 [0.91, 1.17]	8.42
Brion et al., 2010b			_	-		1.04 [0.72, 1.51]	3.49
Egmond-Frohlich et al. , 2012						1.14 [1.12, 1.16]	10.23
Farahat et al., 2014				-		1.30 [1.08, 1.56]	6.99
Fast et al., 2023						1.92 [1.29, 2.86]	3.21
Gustavson et al., 2017						1.19 [1.07, 1.33]	8.82
Haan et al., 2021				•	(0.93 [0.81, 1.06]	8.21
Han et al., 2014						1.15 [1.00, 1.32]	8.19
Knopik et al., 2009			-	-	_	1.59 [0.87, 2.91]	1.69
Knopik et al., 2005			-	-	(0.79 [0.53, 1.18]	3.18
Koshy et al., 2010			-	<u> </u>	(0.59 [0.18, 1.94]	0.50
Kovess et al., 2014				-	,	1.17 [0.92, 1.49]	5.68
Langley et al., 2012					,	1.43 [0.98, 2.08]	3.49
Lin et al., 2021						1.43 [1.36, 1.50]	9.94
Liu et al., 2022				-	-2	2.57 [1.63, 4.05]	2.66
Nomura et al., 2010				<u> </u>	(0.31 [0.05, 1.75]	0.24
Tanaka et al., 2016				-	,	1.04 [0.70, 1.55]	3.17
Zhu et al., 2014					,	1.29 [1.14, 1.46]	8.39
Overall				•		1.22 [1.12, 1.33]	
Heterogeneity: $\tau^2 = 0.02$, $I^2 = 84.55\%$, $H^2 = 6.47$							
Test of $\theta_i = \theta_i$: Q(19) = 122.98, p = 0.00							
Test of θ = 0: z = 4.49, p = 0.00							
	0.05	0 25		4			

	OR	
Study	with 95% CI	p-value

RESULTS

- <u>Twenty</u> observational studies, involving over <u>294,236</u> study participants from 16 different countries, were included.
- We found that paternal smoking was associated with a 22% increased risk of ADHD in children (RR=1.22, 95% CI: 1.12, 1.33).
- This association was only evident in studies that did not account for maternal smoking (OR=1.23, 95% CI1.10, 1.38, *n* = 8).
- No increased risk of ADHD was found in studies that adjusted for maternal smoking (OR=1.14, 95% CI: 0.98, 1.33).



Knopik et al., 2005 —		0.79 [0.53, 1.18]	0.248
+Altink et al., 2009 —		- 1.14 [0.52, 2.48]	0.741
+Knopik et al., 2009		1.25 [0.73, 2.16]	0.421
+Brion et al., 2010a		1.12 [0.84, 1.50]	0.436
+Brion et al., 2010b		1.08 [0.88, 1.33]	0.456
+Koshy et al., 2010		1.06 [0.87, 1.30]	0.553
+Nomura et al., 2010		1.05 [0.85, 1.30]	0.668
+Egmond-Frohlich et al., 2012		1.08 [0.96, 1.22]	0.197
+Langley et al., 2012		1.11 [0.99, 1.24]	0.087
+Farahat et al., 2014		1.14 [1.03, 1.26]	0.014
+Han et al., 2014		1.14 [1.05, 1.23]	0.001
+Kovess et al., 2014		1.14 [1.06, 1.22]	0.000
+Zhu et al., 2014		1.16 [1.08, 1.24]	0.000
+Tanaka et al., 2016	-=-	1.16 [1.08, 1.23]	0.000
+Gustavson et al., 2017	-=-	1.16 [1.10, 1.23]	0.000
+Biederman et al., 2020	-=-	1.17 [1.10, 1.23]	0.000
+Haan et al., 2021	-#-	1.14 [1.07, 1.22]	0.000
+Lin et al., 2021		1.17 [1.08, 1.28]	0.000
+liu et al., 2022		1.20 [1.10, 1.31]	0.000
+Fast et al., 2023		1.22 [1.12, 1.33]	0.000
	1 2		
	1 2		
Figure 3. Cumulative meta-analy	ysis		

CONCLUSIONS

- Paternal smoking may increase the risk of ADHD in children.
- Maternal smoking may confound the observed association.



Figure 1. PRISMA flow diagram

Future studies should focus on maternal and paternal comparisons to disentangle the independent and combined effects of parental smoking on ADHD risk in children.

AUTHOR CONTACT INFORMATION

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