**ERJ-00477-2019: Supplementary file**

**Title: Association of asthma and smoking with lung function impairment in adolescence and early adulthood; the Isle of Wight Birth Cohort Study**

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**Table S1. Demographic and clinical disease details of the participants**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | All  (n=1030) | Non-smokers without asthma (n=600) | Non-smokers with asthma (n=108) | Smokers without asthma (n=270) | Smokers with asthma (n=52) |
| **At birth** |  |  |  |  |  |
| Male sex | 470 (45.6%) | 283 (47.2%) | 41 (38.0%) | 124 (46.0%) | 22 (42.3%) |
| Mother smokes | 379 (25.0%) | 119 (20.0%) | 17 (15.7%) | 73 (27.3%) | 14 (28.0%) |
| Father smokes | 572 (38.4%) | 180 (69.9%) | 33 (31.1%) | 116 (44.1%) | 28 (54.9%) |
| Maternal doctor diagnosed asthma | 112 (10.9%) | 60 (10.0%) | 13 (12.0%) | 25 (9.3%) | 14 (26.9%) |
| Maternal eczema | 124 (12.0%) | 67 (11.2%) | 11 (10.2%) | 33 (12.2%) | 13 (25.0%) |
| Maternal hayfever | 210 (20.4%) | 115 (19.2%) | 29 (26.9%) | 52 (19.3%) | 154 (26.9%) |
| Paternal doctor diagnosed asthma | 88 (8.5%) | 51 (8.5%) | 11 (10.2%) | 19 (7.0%) | 7 (13.5%) |
| Paternal eczema | 73 (7.1%) | 47 (7.8%) | 6 (5.6%) | 18 (6.7%) | 2 (3.9%) |
| Paternal hayfever | 150 (14.6%) | 90 (15.0%) | 16 (14.8%) | 40 (14.8%) | 4 (7.7%) |
| **At 26 years** |  |  |  |  |  |
| Mean BMI, Kg/m2 | 26.1 (6.0) | 25.8 (5.7) | 26.9 (6.6) | 26.2 (6.2) | 28.4 (7.3) |
| Atopic | 254 (45.7%) | 128 (40.4%) | 44 (67.7%) | 55 (38.5%) | 27 (87.1%) |
| Employed | 847 (82.5%) | 506 (84.5%) | 92 (85.0%) | 208 (77.6%) | 41 (78.8%) |
| Current smoking | 322 (31.3%) | 0 (0.0%) | 0 (0.0%) | 270 (100.0%) | 52 (100.0%) |
| Smoking ever | 641 (62.2%) | 170 (28.3%) | 33 (30.6%) | 270 (100.0%) | 52 (100.0%) |
| For smokers ever, median duration, years | 9 (6,11) | 5 (3,8) | 7 (4,8) | 11 (8,12) | 11 (9,13) |
| Other householder smoker | 268 (26.0%) | 87 (15.5%) | 22 (20.4%) | 134 (49.6%) | 25 (48.1%) |
| Wheeze ever | 441 (42.8%) | 171 (28.5%) | 101 (93.5%) | 117 (43.3%) | 52 (100.0%) |
| Wheeze in last year at 26 years | 237 (23.0%) | 52 (8.7%) | 89 (82.4%) | 44 (16.3%) | 52 (100.0%) |
| Ever had asthma | 325 (31.6%) | 109 (18.2%) | 108 (100.0%) | 56 (20.7%) | 52 (100.0%) |
| Physician diagnosed asthma | 318 (30.9%) | 106 (17.7%) | 108 (100.0%) | 52 (19.3%) | 52 (100.0%) |
| Median duration of asthma by 26 years, years | 5 (3,9) | - | 6.5 (4,11) | - | 4 (2,7) |
| Rhinitis symptoms ever | 486 (47.2%) | 245 (40.8%) | 75 (69.4%) | 128 (47.4%) | 38 (73.1%) |
| Rhinitis symptoms in last year | 435 (42.2%) | 220 (36.7%) | 69 (63.9%) | 110 (40.7%) | 36 (69.2%) |
| *Also conjunctivitis* | *278 (64.0%)* | *120 (54.5%* | *56 (81.2%)* | *70 (64.2%)* | *32 (91.4%* |
| Hay fever ever | 474 (46.0%) | 243 (40.5%) | 74 (68.5%) | 120 (44.4%) | 37 (71.2%) |
| Recurrent itchy rash ever | 232 (22.5%) | 123 (20.5%) | 33 (30.6%) | 53 (19.6%) | 23 (44.2%) |
| Recurrent itchy rash in last year | 170 (16.5%) | 89 (14.8%) | 25 (23.2%) | 36 (13.3%) | 20 (38.5%) |
| *Affected folds of the elbows behind knees, ankles* | *104 (61.5%* | *53 (60.2%* | *15 (60.0%)* | *21 (58.3%)* | *15 (75.0%)* |
| Eczema ever | 296 (28.7%) | 154 (25.7%) | 49 (45.4%) | 66 (24.4%) | 27 (51.9%) |

Note: Figures represent mean (standard deviation) or median (25th and 75th quartiles). Data are raw data from baseline (birth) and 26 year questionnaires. Further information can be found below.

**Additional information for table S1**

|  |  |
| --- | --- |
| **Variable** | **Questionnaire question** |
| Ever household smoker | Does anyone else in your household smoke? |
| Wheeze ever | Have you ever had wheezing or whistling in the chest at any time in the past? |
| Wheeze in last year at 26 years | Have you had wheezing or whistling in the chest in the last 12 months? |
| Ever had asthma | Have you ever had asthma? |
| Physician diagnosed asthma | If you have ever had asthma was it physician diagnosed? |
| Rhinitis symptoms ever | Have you ever had a problem with sneezing or a runny or blocked nose when you did not have a cold? |
| Rhinitis symptoms in last year | In the past 12 months have you had a problem with sneezing or a runny or blocked nose when you did not have a cold? |
| Also conjunctivitis | In the past 12 months has this nose problem been accompanied by itchy watery eyes? |
| Hay fever ever | Have you ever had hay fever? |
| Recurrent itchy rash ever | Have you ever had an itchy rash which comes and goes for at least 6 months? |
| Recurrent itchy rash in last year | Have you had this itchy rash at any time in the last 12 months? |
| Affected folds of the elbows behind knees, ankles | Has this rash at any time affected the folds of the elbows behind knees, ankles? |
| Eczema ever | Have you ever had eczema? |

Questions used to generate the variables in Table S1.

**Table S2. Characteristics of participants in the analysis data set**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Variable** | **All (N=1456)** | **Analysis population (N=1030)** | **Participants with LFT at 10 years (N=980)** | **Participants with LFT at 18 years (N=839)** | **Participants with LFT at 26 years (N=547)** |
| Male sex | 735 (50.5%) | 470 (45.6%) | 488 (49.8%) | 396 (47.2%) | 236 (43.2%) |
| Mean BMI, Kg/m2 | 26.1 (6.0) | 26.1 (6.0) | 26.1 (6.0) | 26.0 (6.0) | 26.2 (6.0) |
| Employed at 26 years | 847 (82.4%) | 847 (82.4%) | 621 (83.4%) | 589 (84.3%) | 464 (85.0%) |
| LFT at 10 years | 980 | 745 | 745 | 589 | 458 |
| LFT at 18 years | 839 | 699 | 589 | 699 | 454 |
| LFT at 26 years | 547 | 547 | 458 | 454 | 457 |
| Ever asthma at 26 years | 325 (31.6%) | 325 (31.6%) | 238 (31.9%) | 216 (30.9%) | 182 (33.3%) |
| Wheeze in last year at 26 years | 237 (23.0%) | 237 (23.0%) | 177 (23.7%) | 152 (21.7%) | 141 (25.8%) |
| Hay fever ever at 26 years | 474 (46.0%) | 474 (46.0%) | 353 (47.4%) | 329 (56.2%) | 258 (47.2%) |
| Eczema ever at 26 years | 296 (28.7%) | 296 (28.7%) | 219 (29.4%) | 197 (28.2%) | 171 (31.3%) |
| Smoking at 26 years | 322 (31.3%) | 322 (31.3%) | 243 (32.6%) | 208 (29.8%) | 172 (31.4%) |

Figures represent mean (standard deviation) or median (25th and 75th quartiles). Data are crude data from baseline (birth) and 26 year questionnaires. LFT = lung function testing

Participants who attended the Centre for lung function measurements (n=547) were compared to cohort members who participated at 26 years assessment and provided any data (Table S2). There were no significant differences indicating that the subgroup who was assessed for lung function was representative of the overall cohort. .

**Table S3. Spirometry at 10, 18 and 26 years of age in male and female participants**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Male** | | | **Female** | | |
|  | **10 years** | **18 years** | **26 years** | **10 years** | **18 years** | **26 years** |
| **FEV1 (L)** | 2.06 (0.30) | 4.62 (0.62) | 4.61 (0.72) | 2.00 (0.29) | 3.47 (0.45) | 3.42 (0.43) |
| **FEV1 percent predicted** | 98.9% (11.5) | 106.75% (13.48) | 98.85% (12.71) | 98.1% (11.0) | 100.74% (12.36) | 100.79% (10.88) |
| **Post-FEV1 (L)** |  | 4.83 (0.64) | 4.81 (0.72) |  | 3.64 (0.46) | 3.55 (0.44) |
| **Post-FEV1 percent predicted** |  | 106.75% (13.48) | 103.22% (12.24) |  | 100.74% (12.36) | 104.26% (10.84) |
| **FVC** | 2.35 (0.34) | 5.35 (0.72) | 5.85 (0.82) | 2.24 (0.33) | 3.96 (0.53) | 4.24 (0.54) |
| **FVC percent predicted** | 101.2 (10.7) | 112.9 (15.7) | 104.3 (11.7) | 100.0 (9.5) | 107.0 (15.0) | 106.5 (11.3) |
| **FEV1/FVC** | 0.88 (0.06) | 0.87 (0.07) | 0.79 (0.07) | 0.90 (0.06) | 0.88 (0.07) | 0.81 (0.06) |
| **FEV1/FVC percent predicted** | 101.18% (6.94) | 101.08% (8.60) | 94.33% (8.59) | 104.09% (6.51) | 101.38% (8.84) | 94.27% (7.41) |
| **Post- FEV1/FVC** |  | 0.89 (0.07) | 0.83 (0.06) |  | 0.91 (0.06) | 0.85 (0.06) |
| **Post- FEV1/FVC percent predicted** |  | 104.17% (7.75) | 98.73% (7.78) |  | 104.62% (8.21) | 98.39% (6.92) |
| **FEF25-75 (L)** | 2.38 (0.56) | 4.99 (1.16) | 4.37 (1.24) | 2.48 (0.56) | 3.95 (0.87) | 3.44 (0.84) |
| **FEF25-75 percent predicted** | 95.23% (21.21) | 110.82% (25.91) | 90.42% (24.74) | 104.76% (22.75) | 102.39% (32.80) | 89.83% (21.68) |
| **Post-FEF25-75 (L)** |  | 5.51 (1.11) | 5.08 (1.30) |  | 4.40 (0.89) | 4.00 (0.88) |
| **Post-FEF25-75 (L) percent predicted** |  | 123.98% (25.50) | 105.19% (25.44) |  | 114.95% (34.51) | 104.29% (22.52) |

Figures are means (standard deviations). Data represent crude data. Lung function was only repeated after bronchodilator at 18 and 26 year assessments.

**Table S4. Lung function at 26 year by parental smoking at birth**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Parental smoking at birth** | | | |  | **No parental smoking at birth** | | | |
| **Pre-bronchodilator** | | | | | | | | | |
|  | **FEV1** | **FEV1/FVC** | **FEF25-75** | **FVC** |  | **FEV1** | **FEV1/FVC** | **FEF25-75** | **FVC** |
| **Non-smokers without asthma** | 3.98  (3.89, 4.07) | 0.810  (0.798, 0.822) | 3.96  (3.79, 4.13) | 4.94  (4.83, 5.04) |  | 4.03  (3.96, 4.09) | 0.816  (0.807, 0.824) | 4.09  (3.96, 4.21) | 4.96  (4.88, 5.04) |
| **Non-smokers with asthma** | 3.46  (3.23, 3.69) | 0.755  (0.724, 0.786) | 2.96  (2.62, 3.40) | 4.61  (4.33, 4.88) |  | 3.85  (3.71, 4.00) | 0.777  (0.758, 0.796) | 3.47  (3.19, 3.74) | 4.99  (4.82, 5.17) |
| **Smokers without asthma** | 3.83  (3.71, 3.95) | 0.788  (0.773, 0.804) | 3.63  (3.40, 3.85) | 4.89  (4.75, 5.03) |  | 4.02  (3.92, 4.13) | 0.801  (0.787, 0.815) | 3.89  (3.68, 4.09) | 5.04  (4.91, 5.17) |
| **Smokers with asthma** | 3.63  (3.40, 3.87) | 0.770  (0.739, 0.801) | 3.16  (2.71, 3.60) | 4.73  (4.45. 5.01) |  | 3.90  (3.62, 4.18) | 0.737  (0.700, 0.773) | 3.12  (2.60, 3.65) | 5.33  (5.00, 5.67) |
| **Post-bronchodilator** | | | | | | | | | |
| **Non-smokers without asthma** | 4.13  (4.03, 4.22) | 0.845  (0.834, 0.856) | 4.55  (4.37, 4.72) | 4.90  (4.79, 5.01) |  | 4.16  (4.09, 4.23) | 0.847  (0.839, 0.855) | 4.68  (4.55, 4.81) | 4.93  (4.84, 5.00) |
| **Non-smokers with asthma** | 3.69  (3.43, 3.95) | 0.802  (0.771, 0.833) | 3.54  (3.06, 4.03) | 4.63  (4.33, 4.92) |  | 4.12  (3.97, 4.27) | 0.839  (0.821, 0.856) | 4.47  (4.20, 4.75) | 4.93  (4.75, 5.10) |
| **Smokers without asthmas** | 3.95  (3.83, 4.08) | 0.822  (0.808, 0.837) | 4.14  (3.92, 4.37) | 4.83  (4.69, 4.97) |  | 4.20  (4.09, 4.32) | 0.838  (0.824, 9.851) | 4.60  (4.39, 4.81) | 5.02  (4.89. 5.15) |
| **Smokers with asthma** | 3.84  (3.60, 4.08) | 0.798  (0.769, 0.826) | 3.64  (3.19, 4.09) | 4.84  (4.56, 5.11) |  | 4.10  (3.81, 4.39) | 0.763  (0.730, 0.797) | 3.61  (3.07, 4.14) | 5.40  (5.06, 5.74) |

Figures describe the mean value of each lung function parameter at 26 years of age in smokers with asthma (open triangle), non-smokers with asthma (open circles), Smokers without asthma (closed triangle) and non-smokers without asthma (closed circles) from longitudinal models. Data are split between those who were and were not exposure to parental smoking in early life. Data generated from a GEE longitudinal model with parameters adjusted for sex. Values represent means (95% confidence intervals). Data from 454 participants; post-bronchodilator results available for 428 participants.