**Supplementary File 2.** Characteristics of included studies in meta-analysis for selenium

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Author. year | Country | Study  Type | Group | N | Mean level | SD | Data unit | Sample Type | Treatment | Age(Years/Months,  Mean±SD) | Match |
| Bishopp  et al.2017(5) | England | CC | Mild asthma\* | 15 | 76.87 | 10.03 | μg/100mL | Serum | Yes | 34.6y |  |
|  |  | Severe asthma\* | 30 | 78.23 | 11.86 |  |  |  | 41.4y |  |
|  |  | Control | 15 | 76.4 | 10.6 |  |  |  | 37.6y |  |
| Ariaee  et al.2016(16) | Iran | CC | Asthma | 49 | 121.5 | 21 | μg/L | Serum | NA | 35.6±10y |  |
|  |  | Control | 24 | 127 | 19 |  |  |  | 37.3±11y |  |
| Oluwole  et al.2014(13) | Nigeria | CC | Asthma | 37 | 76.1 | 14.9 | μg/L | Serum | No | 13-14y | Age gender school location |
|  |  | Control | 30 | 63.3 | 26.8 |  |  |  | 13-14y |
| Fabian  et al.2013(9) | Hungary | CC | Asthma | 35 | 0.75 | 0.1 | μmol/L | Plasma | No | 10y | Age and sex |
|  |  | Control | 21 | 0.87 | 0.2 |  |  |  | 9y |
| Guo  et al.2011(10) | China | CC | Asthma | 25 | 0.057 | 0.024 | μg/mL | Plasma | No | 35±7y | Age and gender |
|  |  | Control | 25 | 0.116 | 0.022 |  |  |  | 38±10y |
| Razi  et al.2011(37) | Turkey | CS | Asthma | 100 | 115.6 | 18.7 | mg/dL | Serum | NA | 27.5±13.4m | Age sex |
|  |  | Control | 116 | 125.4 | 31.7 |  |  |  | 30.5±12.2m |  |
| Urushidate  et al.2010(25) | Japan | CS | Asthma Males | 21 | 240.4 | 41.2 | μg/L | Serum | NA | 56.5±14.5y |  |
|  |  | Control Males | 364 | 245.8 | 40.1 |  |  |  | 56.5±14.5y |  |
|  |  | Asthma Females | 27 | 243.5 | 39.5 |  |  |  | 57.2±14.0y |  |
|  |  | Control Females | 613 | 235.5 | 39.6 |  |  |  | 57.2±14.0y |  |
| Burney  et al.2008(29) | Belgium | CC | Asthma | 76 | 85.9 | 17.5 | μg/L | Plasma | NA | 32y | Age, gender |
|  |  | Control | 59 | 82.7 | 16 |  |  |  | 29y |
| Burney  et al.2008(29) | Austria | CC | Asthma | 12 | 66.7 | 10.2 | μg/L | Plasma | NA | 35y | Age, gender |
|  |  | Control | 46 | 67.7 | 13.1 |  |  |  | 33y |
| Burney  et al.2008(29) | Denmark | CC | Asthma | 50 | 79.2 | 11.3 | μg/L | Plasma | NA | 34y | Age, gender |
|  |  | Control | 41 | 76.4 | 11.5 |  |  |  | 32y |
| Burney  et al.2008(29) | Germany | CC | Asthma | 18 | 87 | 9.7 | μg/L | Plasma | NA | 39y | Age, gender |
|  |  | Control | 33 | 82.4 | 15.2 |  |  |  | 38y |
| Burney  et al.2008(29) | Italy | CC | Asthma | 41 | 113 | 19.8 | μg/L | Plasma | NA | 34y | Age, gender |
|  |  | Control | 53 | 116.3 | 17.5 |  |  |  | 35y |  |
| Burney  et al.2008(29) | Italy | CC | Asthma | 28 | 88.5 | 11.3 | μg/L | Plasma | NA | 35y | Age, gender |
|  |  | Control | 21 | 88.6 | 13 |  |  |  | 34y |  |
| Burney  et al.2008(29) | Holland | CC | Asthma | 38 | 87.7 | 15.8 | μg/L | Plasma | NA | 35y | Age, gender |
|  |  | Control | 38 | 82 | 11.9 |  |  |  | 33y |  |
| Burney  et al.2008(29) | Poland | CC | Asthma | 52 | 69.5 | 15.1 | μg/L | Plasma | NA | 31y | Age, gender |
|  |  | Control | 44 | 72.9 | 14.8 |  |  |  | 29y |  |
| Burney  et al.2008(29) | Portuguese | CC | Asthma | 51 | 94.5 | 13.9 | μg/L | Plasma | NA | 33y | Age, gender |
|  |  | Control | 46 | 95.7 | 11 |  |  |  | 32y |  |
| Burney  et al.2008(29) | Spain | CC | Asthma | 44 | 100 | 16.1 | μg/L | Plasma | NA | 34y | Age, gender |
|  |  | Control | 44 | 102.1 | 13.4 |  |  |  | 33y |  |
| Burney  et al.2008(29) | Sweden | CC | Asthma | 38 | 79.5 | 11.6 | μg/L | Plasma | NA | 39y | Age, gender |
|  |  | Control | 17 | 79.89 | 8.5 |  |  |  | 38y |  |
| Burney  et al.2008(28) | England | CC | Asthma | 50 | 97.2 | 19.9 | μg/L | Plasma | NA | 38y | Age, gender |
|  |  | Control | 51 | 99 | 17.8 |  |  |  | 38y |  |
| Burney  et al.2008(29) | Greece | CC | Asthma | 27 | 82.7 | 10.9 | μg/L | Plasma | NA | 10y | Age, gender |
|  |  | Control | 30 | 80.3 | 13.1 |  |  |  | 10y |  |
| Burney  et al.2008(29) | Norway | CC | Asthma | 42 | 56.4 | 9.4 | μg/L | Plasma | NA | 9y | Age, gender |
|  |  | Control | 51 | 56.1 | 9.6 |  |  |  | 9y |  |
| Hussein  et al.2008(38) | Sudan | CC | Asthma | 100 | 65.8 | 5.5 | μg/L | Serum | NA | 20-65y | Age sex |
|  |  | Control | 170 | 78.2 | 7.5 |  |  |  | 20-65y |  |
| Jacobson  et al.2007(39) | Australia | CC | Asthma | 15 | 99 | 34 | μg/L | Plasma | Yes | 38.7 (22-64)y | Age and gender |
|  |  | Control | 15 | 109 | 17 |  |  |  | 38.7 (22-64)y |
| Kocabas  et al.2006(11) | Turkey | CC | Asthma | 61 | 61.95 | 9.37 | μg/L | Serum | NA | 25.14±1.54m | Age sex |
|  |  | Control | 61 | 72.71 | 9.98 |  |  |  | 22.2±1.51m |  |
| Khadadah  et al.2005(40) | Kuwait | CC | Asthma(all) | 50 | 82.85 | 15.84 | NA | Serum | Yes | 37±13.51y | Age sex |
|  |  | Males | 32 | 84 | 15.95 |  |  |  |  |  |
|  |  | Females | 18 | 80.8 | 15.7 |  |  |  |  |  |
|  |  | Control | 379 | 88.3 | 19.86 |  |  |  | 37.6±11.49y |  |
|  |  | Males | 262 | 86.2 | 39.5 |  |  |  |  |  |
|  |  | Females | 117 | 80.9 | 62.63 |  |  |  |  |  |
| Rubin  et al.2004(41) | America | CS | Asthma | 415 | 115.7 | 14.5 | μg/dL | Serum | NA | 117.3±47.2m |  |
|  |  | Control | 5305 | 117.3 | 14.4 |  |  |  | 115.8±45.9m |  |
| Kocyigit  et al.2004(31) | Turkey | CC | Asthma | 44 | 59.92 | 22.91 | μg/L | Plasma | Yes | 8.2±4.3y |  |
|  |  | Control | 32 | 76.5 | 14.69 |  |  |  | 7.3±3.3y |  |
| Ford  et al.2004(28) | America | CS | Current asthma | 706 | 1.61 | 0.53 | nmol/L | Serum | NA | 44.8±18.6y |  |
|  |  | Former asthma | 321 | 1.61 | 0.54 |  |  |  | 44.2±17.9y |  |
|  |  |  | Control | 14366 | 1.59 | 1.2 |  |  |  | Na |  |
|  |  |  | Current asthma | 503 | 1.62 | 1.45 |  |  |  | 44.8±15.6y |  |
|  |  |  | Former asthma | 232 | 1.61 | 0.46 |  |  |  | 44.2±15.2y |  |
|  |  |  | Control | 10917 | 1.59 | 1.04 |  |  |  | Na |  |
| Qujeq  et al.2003(42) | Iran | CC | Asthma | 46 | 1.15 | 0.23 | µmol/L | Serum | NA | 51.8±7.3y | Age sex |
|  |  | Control | 75 | 1.98 | 0.27 |  |  |  | 48.2±8.2 y |  |
| Omland  et al.2002(43) | Denmark | CS | Asthma | 72 | 74.36 | 10.56 | μg/L | Serum | Yes | 18.1±1.05y |  |
|  |  | Control | 41 | 77.39 | 11.74 |  |  |  | 18.2±1.02y |  |
|  |  | Control | 10917 | 1.59 | 1.04 |  |  |  | Na |  |
| Picado  et al.2001(32) | Spain | CC | Asthma(all) | 118 | 79 | 11.94 | mg/dL | Serum | Yes | 41.6±15.2y |  |
|  |  | Intermittent\* | 30 | 77.5 | 14.79 |  |  |  | NA |  |
|  |  | Mild\* | 40 | 76.5 | 13.91 |  |  |  | NA |  |
|  |  | Moderate\* | 24 | 77.1 | 15.18 |  |  |  | NA |  |
|  |  | Severe\* | 24 | 75 | 53.89 |  |  |  | NA |  |
|  |  | Control | 121 | 75.5 | 29.7 |  |  |  | 38.8±14.3y |  |
| Fenech  et al.1998(44) | Malta | CC | Mild\* | 22 | 116.4 | 22.51 | ng/mL | Plasma | No | 18-49y |  |
|  |  | Severe\* | 37 | 117.3 | 19.46 |  |  |  |  |  |
|  |  | Control | 49 | 114.4 | 32.9 |  |  |  |  |  |
| Kadrabova  et al.1996(45) | Slovak | CC | Asthma | 22 | 50.1 | 7.5 | μg/L | Plasma | Yes | 51.6±13.6y |  |
|  |  | Control | 33 | 58.4 | 6.9 |  |  |  | 50.8±10.9y |  |
| Misso  et al.1996(48) | Australia | CC | Asthma | 41 | 1.07 | 0.12 | μmol/L | Serum | Yes | 18-69y | Age sex |
|  |  | Control | 41 | 1.16 | 0.31 |  |  |  | 19-54y |  |
| Malvy  et al.1993(35) | France | CC | Asthma Males | 6 | 0.43 | 0.21 | μmol/L | Plasma | Yes | 6-12y | Age |
|  |  | Control Males | 12 | 1.00 | 0.25 |  |  |  | 6-12y |  |
| Flatt  et al.1990(46) | New Zealand | CC | Asthma | 56 | 58.7 | 14.22 | ng/mL | Plasma | Yes | 15-62y | Age sex |
|  |  | Control | 59 | 60.6 | 13.83 |  |  |  | 15-62y |  |
| Stone  et al.1989(47) | England | CC | Asthma | 49 | 1.07 | 0.16 | μmol/L | Plasma | Yes | 15-61y |  |
|  |  | Control | 76 | 1.19 | 0.19 |  |  |  | 18-63y |  |

\*Severe, Mild/Moderate: on behalf of the severity of asthma;

Abbreviation: CC: case-control study; CS: cross-sectional study; SD: standard deviation; NA: not available.