**Table e-4:** **Meta-analysis results of the logistic regressions with sex, age, and metabolite concentrations as independent variables and migraine status as dependent variable.**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Metabolite abbreviation | Β | CI | Unadjusted P-value | P-value | I2 (%) |
| XXL-VLDL-P | 0.05 | -0.03:0.14 | 0.222 | 1.000 | 55 |
| XXL-VLDL-L | 0.05 | -0.03:0.14 | 0.219 | 1.000 | 56 |
| XXL-VLDL-PL | 0.04 | -0.05:0.13 | 0.356 | 1.000 | 54 |
| XXL-VLDL-C | 0.06 | -0.03:0.14 | 0.172 | 1.000 | 54 |
| XXL-VLDL-CE | 0.07 | -0.01:0.15 | 0.105 | 1.000 | 52 |
| XXL-VLDL-FC | 0.05 | -0.05:0.14 | 0.330 | 1.000 | 61 |
| XXL-VLDL-TG | 0.05 | -0.03:0.14 | 0.236 | 1.000 | 56 |
| XL-VLDL-P | 0.04 | -0.05:0.13 | 0.352 | 1.000 | 56 |
| XL-VLDL-L | 0.05 | -0.04:0.14 | 0.307 | 1.000 | 58 |
| XL-VLDL-PL | 0.04 | -0.05:0.13 | 0.358 | 1.000 | 56 |
| XL-VLDL-C | 0.05 | -0.03:0.14 | 0.235 | 1.000 | 57 |
| XL-VLDL-CE | 0.06 | -0.03:0.14 | 0.170 | 1.000 | 53 |
| XL-VLDL-FC | 0.05 | -0.03:0.14 | 0.232 | 1.000 | 56 |
| XL-VLDL-TG | 0.04 | -0.05:0.13 | 0.336 | 1.000 | 58 |
| L-VLDL-P | 0.05 | -0.05:0.14 | 0.340 | 1.000 | 61 |
| L-VLDL-L | 0.06 | -0.04:0.15 | 0.254 | 1.000 | 65 |
| L-VLDL-PL | 0.04 | -0.05:0.14 | 0.354 | 1.000 | 61 |
| L-VLDL-C | 0.06 | -0.04:0.16 | 0.258 | 1.000 | 65 |
| L-VLDL-CE | 0.07 | -0.03:0.17 | 0.156 | 1.000 | 68 |
| L-VLDL-FC | 0.04 | -0.05:0.14 | 0.358 | 1.000 | 62 |
| L-VLDL-TG | 0.05 | -0.05:0.15 | 0.301 | 1.000 | 63 |
| M-VLDL-P | 0.07 | -0.03:0.18 | 0.177 | 1.000 | 69 |
| M-VLDL-L | 0.08 | -0.03:0.18 | 0.149 | 1.000 | 70 |
| M-VLDL-PL | 0.07 | -0.03:0.18 | 0.167 | 1.000 | 70 |
| M-VLDL-C | 0.08 | -0.02:0.18 | 0.138 | 1.000 | 68 |
| M-VLDL-CE | 0.08 | -0.02:0.17 | 0.127 | 1.000 | 66 |
| M-VLDL-FC | 0.06 | -0.04:0.17 | 0.226 | 1.000 | 69 |
| M-VLDL-TG | 0.07 | -0.03:0.17 | 0.183 | 1.000 | 69 |
| S-VLDL-P | 0.09 | -0.01:0.19 | 0.095 | 1.000 | 67 |
| S-VLDL-L | 0.09 | -0.01:0.20 | 0.085 | 1.000 | 70 |
| S-VLDL-PL | 0.09 | -0.01:0.18 | 0.075 | 1.000 | 63 |
| S-VLDL-C | 0.09 | -0.01:0.18 | 0.081 | 1.000 | 63 |
| S-VLDL-CE | 0.08 | -0.01:0.17 | 0.068 | 1.000 | 56 |
| S-VLDL-FC | 0.08 | -0.03:0.18 | 0.144 | 1.000 | 69 |
| S-VLDL-TG | 0.08 | -0.03:0.19 | 0.148 | 1.000 | 71 |
| XS-VLDL-P | 0.07 | -0.01:0.16 | 0.102 | 1.000 | 57 |
| XS-VLDL-L | 0.07 | -0.01:0.16 | 0.100 | 1.000 | 56 |
| XS-VLDL-PL | 0.05 | -0.03:0.13 | 0.206 | 1.000 | 49 |
| XS-VLDL-C | 0.07 | 0.00:0.13 | 0.046 | 1.000 | 29 |
| XS-VLDL-CE | 0.07 | 0.01:0.13 | 0.033 | 1.000 | 21 |
| XS-VLDL-FC | 0.06 | -0.01:0.13 | 0.071 | 1.000 | 32 |
| XS-VLDL-TG | 0.07 | -0.03:0.17 | 0.169 | 1.000 | 66 |
| VLDL-D | 0.06 | -0.04:0.15 | 0.222 | 1.000 | 64 |
| VLDL-C | 0.09 | -0.01:0.19 | 0.094 | 1.000 | 66 |
| VLDL-TG | 0.07 | -0.03:0.18 | 0.173 | 1.000 | 71 |
| IDL-P | 0.04 | -0.04:0.11 | 0.314 | 1.000 | 38 |
| IDL-L | 0.04 | -0.04:0.11 | 0.331 | 1.000 | 36 |
| IDL-PL | 0.02 | -0.04:0.09 | 0.476 | 1.000 | 22 |
| Metabolite abbreviation | Β | CI | Unadjusted P-value | P-value | I2 (%) |
| IDL-C | 0.03 | -0.03:0.09 | 0.367 | 1.000 | 23 |
| IDL-CE | 0.03 | -0.03:0.10 | 0.321 | 1.000 | 30 |
| IDL-FC | 0.02 | -0.03:0.07 | 0.473 | 1.000 | 4 |
| IDL-TG | 0.04 | -0.06:0.13 | 0.452 | 1.000 | 65 |
| L-LDL-P | 0.03 | -0.04:0.11 | 0.407 | 1.000 | 39 |
| L-LDL-L | 0.03 | -0.04:0.11 | 0.417 | 1.000 | 40 |
| L-LDL-PL | 0.03 | -0.04:0.10 | 0.409 | 1.000 | 34 |
| L-LDL-C | 0.03 | -0.04:0.10 | 0.407 | 1.000 | 31 |
| L-LDL-CE | 0.03 | -0.04:0.11 | 0.373 | 1.000 | 37 |
| L-LDL-FC | 0.02 | -0.04:0.08 | 0.464 | 1.000 | 12 |
| L-LDL-TG | 0.01 | -0.07:0.09 | 0.820 | 1.000 | 51 |
| M-LDL-P | 0.04 | -0.04:0.12 | 0.366 | 1.000 | 46 |
| M-LDL-L | 0.04 | -0.04:0.12 | 0.349 | 1.000 | 48 |
| M-LDL-PL | 0.04 | -0.04:0.13 | 0.282 | 1.000 | 48 |
| M-LDL-C | 0.04 | -0.04:0.11 | 0.331 | 1.000 | 40 |
| M-LDL-CE | 0.04 | -0.03:0.11 | 0.307 | 1.000 | 38 |
| M-LDL-FC | 0.03 | -0.04:0.10 | 0.424 | 1.000 | 35 |
| M-LDL-TG | 0.00 | -0.08:0.07 | 0.899 | 1.000 | 43 |
| S-LDL-P | 0.03 | -0.05:0.12 | 0.399 | 1.000 | 47 |
| S-LDL-L | 0.04 | -0.05:0.12 | 0.383 | 1.000 | 48 |
| S-LDL-PL | 0.04 | -0.04:0.12 | 0.365 | 1.000 | 49 |
| S-LDL-C | 0.03 | -0.04:0.10 | 0.374 | 1.000 | 35 |
| S-LDL-CE | 0.03 | -0.04:0.10 | 0.355 | 1.000 | 30 |
| S-LDL-FC | 0.03 | -0.04:0.10 | 0.404 | 1.000 | 38 |
| S-LDL-TG | 0.02 | -0.07:0.11 | 0.714 | 1.000 | 60 |
| LDL-D | 0.00 | -0.07:0.06 | 0.900 | 1.000 | 28 |
| LDL-C | 0.03 | -0.04:0.11 | 0.366 | 1.000 | 36 |
| LDL-TG | 0.01 | -0.07:0.09 | 0.815 | 1.000 | 44 |
| XL-HDL-P | -0.11 | -0.17:-0.05 | 0.000 | 0.093 | 18 |
| XL-HDL-L | -0.11 | -0.17:-0.04 | 0.001 | 0.201 | 24 |
| XL-HDL-PL | -0.13 | -0.20:-0.06 | 0.000 | 0.104 | 35 |
| XL-HDL-C | -0.09 | -0.16:-0.03 | 0.007 | 1.000 | 29 |
| XL-HDL-CE | -0.08 | -0.15:-0.02 | 0.015 | 1.000 | 34 |
| XL-HDL-FC | -0.10 | -0.16:-0.04 | 0.001 | 0.187 | 19 |
| XL-HDL-TG | -0.03 | -0.09:0.04 | 0.436 | 1.000 | 26 |
| L-HDL-P | -0.14 | -0.22:-0.05 | 0.001 | 0.274 | 49 |
| L-HDL-L | -0.14 | -0.23:-0.05 | 0.003 | 0.629 | 56 |
| L-HDL-PL | -0.14 | -0.22:-0.05 | 0.003 | 0.577 | 55 |
| L-HDL-C | -0.14 | -0.22:-0.05 | 0.003 | 0.571 | 56 |
| L-HDL-CE | -0.13 | -0.22:-0.05 | 0.002 | 0.508 | 54 |
| L-HDL-FC | -0.14 | -0.23:-0.05 | 0.002 | 0.424 | 56 |
| L-HDL-TG | -0.08 | -0.13:-0.02 | 0.004 | 0.791 | 0 |
| M-HDL-P | -0.05 | -0.12:0.02 | 0.186 | 1.000 | 38 |
| M-HDL-L | -0.05 | -0.12:0.02 | 0.169 | 1.000 | 38 |
| M-HDL-PL | -0.06 | -0.13:0.01 | 0.099 | 1.000 | 31 |
| M-HDL-C | -0.06 | -0.13:0.02 | 0.164 | 1.000 | 46 |
| M-HDL-CE | -0.06 | -0.14:0.02 | 0.141 | 1.000 | 47 |
| M-HDL-FC | -0.04 | -0.12:0.04 | 0.374 | 1.000 | 49 |
| M-HDL-TG | 0.03 | -0.05:0.12 | 0.404 | 1.000 | 54 |
| S-HDL-P | 0.00 | -0.08:0.08 | 0.981 | 1.000 | 51 |
| S-HDL-L | 0.00 | -0.08:0.07 | 0.903 | 1.000 | 50 |
| Metabolite abbreviation | Β | CI | Unadjusted P-value | P-value | I2 (%) |
| S-HDL-PL | -0.03 | -0.10:0.05 | 0.504 | 1.000 | 50 |
| S-HDL-C | 0.00 | -0.07:0.06 | 0.894 | 1.000 | 26 |
| S-HDL-CE | 0.01 | -0.04:0.07 | 0.686 | 1.000 | 7 |
| S-HDL-FC | -0.06 | -0.12:0.01 | 0.094 | 1.000 | 35 |
| S-HDL-TG | 0.06 | -0.04:0.15 | 0.241 | 1.000 | 66 |
| HDL-D | -0.13 | -0.22:-0.05 | 0.002 | 0.390 | 50 |
| HDL-C | -0.11 | -0.19:-0.04 | 0.004 | 0.760 | 40 |
| HDL2-C | -0.13 | -0.21:-0.04 | 0.003 | 0.581 | 50 |
| HDL3-C | 0.01 | -0.04:0.07 | 0.576 | 1.000 | 0 |
| HDL-TG | 0.00 | -0.08:0.08 | 0.986 | 1.000 | 50 |
| Serum-C | 0.00 | -0.05:0.06 | 0.954 | 1.000 | 1 |
| Remnant-C | 0.07 | -0.02:0.16 | 0.135 | 1.000 | 59 |
| EstC | 0.00 | -0.05:0.05 | 0.973 | 1.000 | 0 |
| FreeC | 0.01 | -0.06:0.09 | 0.752 | 1.000 | 39 |
| Serum-TG | 0.07 | -0.04:0.18 | 0.195 | 1.000 | 72 |
| TotPG | -0.05 | -0.11:0.02 | 0.145 | 1.000 | 20 |
| PC | -0.05 | -0.10:0.00 | 0.061 | 1.000 | 0 |
| SM | 0.01 | -0.06:0.09 | 0.727 | 1.000 | 36 |
| TotCho | -0.05 | -0.10:0.00 | 0.061 | 1.000 | 0 |
| ApoA1 | -0.10 | -0.16:-0.05 | 0.000 | **0.029** | 0 |
| ApoB | 0.07 | -0.03:0.17 | 0.147 | 1.000 | 64 |
| TotFA | 0.01 | -0.07:0.10 | 0.739 | 1.000 | 55 |
| UnsatDeg | -0.02 | -0.08:0.03 | 0.414 | 1.000 | 16 |
| FAw3 | -0.06 | -0.11:0.00 | 0.039 | 1.000 | 0 |
| FAw6 | 0.01 | -0.06:0.08 | 0.716 | 1.000 | 32 |
| PUFA | 0.00 | -0.07:0.06 | 0.921 | 1.000 | 19 |
| MUFA | 0.03 | -0.09:0.14 | 0.653 | 1.000 | 74 |
| SFA | 0.01 | -0.07:0.09 | 0.768 | 1.000 | 48 |
| DHA | -0.04 | -0.09:0.01 | 0.154 | 1.000 | 0 |
| LA | 0.02 | -0.05:0.08 | 0.650 | 1.000 | 26 |
| Glc | 0.01 | -0.06:0.07 | 0.797 | 1.000 | 23 |
| Lac | 0.00 | -0.05:0.05 | 0.967 | 1.000 | 0 |
| Pyr | 0.00 | -0.06:0.07 | 0.964 | 1.000 | 0 |
| Cit | -0.03 | -0.08:0.03 | 0.323 | 1.000 | 13 |
| Ala | 0.01 | -0.04:0.06 | 0.599 | 1.000 | 0 |
| Gln | -0.04 | -0.11:0.03 | 0.234 | 1.000 | 0 |
| His | 0.01 | -0.04:0.06 | 0.692 | 1.000 | 5 |
| Ile | 0.04 | -0.05:0.12 | 0.359 | 1.000 | 47 |
| Leu | -0.01 | -0.12:0.10 | 0.898 | 1.000 | 68 |
| Val | -0.02 | -0.14:0.10 | 0.748 | 1.000 | 75 |
| Phe | -0.04 | -0.11:0.04 | 0.363 | 1.000 | 46 |
| Tyr | -0.04 | -0.12:0.03 | 0.262 | 1.000 | 46 |
| AcAce | 0.00 | -0.08:0.07 | 0.899 | 1.000 | 43 |
| bOHBut | -0.02 | -0.06:0.03 | 0.534 | 1.000 | 0 |
| Crea | 0.01 | -0.05:0.07 | 0.843 | 1.000 | 0 |
| Alb | 0.00 | -0.06:0.06 | 0.986 | 1.000 | 29 |
| Gp | 0.07 | -0.03:0.17 | 0.191 | 1.000 | 71 |
| XXL-VLDL-PL\_% | -0.03 | -0.08:0.02 | 0.249 | 1.000 | 0 |
| XXL-VLDL-C\_% | 0.01 | -0.04:0.06 | 0.673 | 1.000 | 0 |
| XXL-VLDL-CE\_% | 0.01 | -0.04:0.06 | 0.629 | 1.000 | 0 |
| XXL-VLDL-FC\_% | -0.04 | -0.11:0.03 | 0.258 | 1.000 | 42 |
| Metabolite abbreviation | Β | CI | Unadjusted P-value | P-value | I2 (%) |
| XXL-VLDL-TG\_% | 0.03 | -0.02:0.08 | 0.304 | 1.000 | 0 |
| XL-VLDL-PL\_% | 0.06 | 0.01:0.11 | 0.025 | 1.000 | 0 |
| XL-VLDL-C\_% | 0.06 | 0.01:0.11 | 0.020 | 1.000 | 0 |
| XL-VLDL-CE\_% | 0.05 | 0.00:0.10 | 0.045 | 1.000 | 0 |
| XL-VLDL-FC\_% | 0.06 | 0.01:0.11 | 0.026 | 1.000 | 0 |
| XL-VLDL-TG\_% | 0.06 | 0.01:0.11 | 0.021 | 1.000 | 0 |
| L-VLDL-PL\_% | 0.03 | -0.02:0.08 | 0.192 | 1.000 | 0 |
| L-VLDL-C\_% | 0.00 | -0.05:0.04 | 0.856 | 1.000 | 0 |
| L-VLDL-CE\_% | 0.02 | -0.03:0.07 | 0.491 | 1.000 | 0 |
| L-VLDL-FC\_% | 0.02 | -0.03:0.07 | 0.342 | 1.000 | 0 |
| L-VLDL-TG\_% | 0.03 | -0.02:0.08 | 0.203 | 1.000 | 0 |
| M-VLDL-PL\_% | 0.01 | -0.04:0.06 | 0.630 | 1.000 | 4 |
| M-VLDL-C\_% | -0.03 | -0.08:0.02 | 0.230 | 1.000 | 0 |
| M-VLDL-CE\_% | -0.03 | -0.08:0.02 | 0.280 | 1.000 | 0 |
| M-VLDL-FC\_% | -0.02 | -0.07:0.03 | 0.488 | 1.000 | 0 |
| M-VLDL-TG\_% | 0.03 | -0.02:0.08 | 0.284 | 1.000 | 0 |
| S-VLDL-PL\_% | -0.04 | -0.12:0.05 | 0.386 | 1.000 | 53 |
| S-VLDL-C\_% | -0.04 | -0.11:0.04 | 0.344 | 1.000 | 43 |
| S-VLDL-CE\_% | -0.03 | -0.10:0.05 | 0.484 | 1.000 | 47 |
| S-VLDL-FC\_% | -0.07 | -0.12:-0.02 | 0.007 | 1.000 | 0 |
| S-VLDL-TG\_% | 0.06 | -0.03:0.14 | 0.189 | 1.000 | 57 |
| XS-VLDL-PL\_% | -0.02 | -0.07:0.03 | 0.482 | 1.000 | 0 |
| XS-VLDL-C\_% | -0.01 | -0.12:0.09 | 0.777 | 1.000 | 71 |
| XS-VLDL-CE\_% | -0.02 | -0.11:0.07 | 0.710 | 1.000 | 64 |
| XS-VLDL-FC\_% | 0.00 | -0.07:0.06 | 0.885 | 1.000 | 28 |
| XS-VLDL-TG\_% | 0.03 | -0.06:0.12 | 0.529 | 1.000 | 63 |
| IDL-PL\_% | -0.05 | -0.16:0.06 | 0.384 | 1.000 | 71 |
| IDL-C\_% | 0.01 | -0.04:0.06 | 0.611 | 1.000 | 0 |
| IDL-CE\_% | 0.02 | -0.03:0.07 | 0.402 | 1.000 | 0 |
| IDL-FC\_% | 0.00 | -0.07:0.06 | 0.951 | 1.000 | 24 |
| IDL-TG\_% | 0.00 | -0.08:0.07 | 0.895 | 1.000 | 46 |
| L-LDL-PL\_% | -0.03 | -0.11:0.05 | 0.494 | 1.000 | 48 |
| L-LDL-C\_% | 0.02 | -0.03:0.07 | 0.362 | 1.000 | 0 |
| L-LDL-CE\_% | 0.04 | -0.03:0.10 | 0.271 | 1.000 | 22 |
| L-LDL-FC\_% | -0.04 | -0.15:0.07 | 0.497 | 1.000 | 71 |
| L-LDL-TG\_% | -0.02 | -0.07:0.03 | 0.367 | 1.000 | 0 |
| M-LDL-PL\_% | -0.03 | -0.10:0.04 | 0.415 | 1.000 | 29 |
| M-LDL-C\_% | 0.03 | -0.02:0.08 | 0.270 | 1.000 | 0 |
| M-LDL-CE\_% | 0.04 | -0.03:0.10 | 0.245 | 1.000 | 25 |
| M-LDL-FC\_% | -0.05 | -0.14:0.03 | 0.225 | 1.000 | 51 |
| M-LDL-TG\_% | -0.02 | -0.07:0.03 | 0.454 | 1.000 | 0 |
| S-LDL-PL\_% | -0.04 | -0.10:0.02 | 0.230 | 1.000 | 22 |
| S-LDL-C\_% | 0.04 | -0.01:0.09 | 0.148 | 1.000 | 0 |
| S-LDL-CE\_% | 0.03 | -0.02:0.09 | 0.226 | 1.000 | 0 |
| S-LDL-FC\_% | -0.03 | -0.11:0.05 | 0.437 | 1.000 | 41 |
| S-LDL-TG\_% | 0.00 | -0.07:0.08 | 0.920 | 1.000 | 40 |
| XL-HDL-PL\_% | -0.05 | -0.11:0.00 | 0.061 | 1.000 | 0 |
| XL-HDL-C\_% | 0.10 | 0.02:0.18 | 0.018 | 1.000 | 43 |
| XL-HDL-CE\_% | 0.07 | -0.01:0.15 | 0.073 | 1.000 | 26 |
| XL-HDL-FC\_% | 0.01 | -0.04:0.06 | 0.728 | 1.000 | 0 |
| XL-HDL-TG\_% | 0.07 | -0.03:0.18 | 0.170 | 1.000 | 70 |
| Metabolite abbreviation | Β | CI | Unadjusted P-value | P-value | I2 (%) |
| L-HDL-PL\_% | 0.00 | -0.05:0.05 | 0.926 | 1.000 | 0 |
| L-HDL-C\_% | -0.03 | -0.08:0.02 | 0.307 | 1.000 | 0 |
| L-HDL-CE\_% | -0.02 | -0.07:0.03 | 0.472 | 1.000 | 0 |
| L-HDL-FC\_% | -0.04 | -0.12:0.03 | 0.249 | 1.000 | 41 |
| L-HDL-TG\_% | 0.03 | -0.03:0.09 | 0.347 | 1.000 | 23 |
| M-HDL-PL\_% | 0.00 | -0.05:0.05 | 0.946 | 1.000 | 4 |
| M-HDL-C\_% | -0.04 | -0.10:0.03 | 0.285 | 1.000 | 33 |
| M-HDL-CE\_% | -0.04 | -0.12:0.04 | 0.349 | 1.000 | 51 |
| M-HDL-FC\_% | -0.02 | -0.09:0.06 | 0.631 | 1.000 | 41 |
| M-HDL-TG\_% | 0.08 | -0.02:0.17 | 0.105 | 1.000 | 62 |
| S-HDL-PL\_% | -0.04 | -0.11:0.03 | 0.291 | 1.000 | 40 |
| S-HDL-C\_% | 0.01 | -0.05:0.07 | 0.814 | 1.000 | 16 |
| S-HDL-CE\_% | 0.02 | -0.04:0.08 | 0.454 | 1.000 | 9 |
| S-HDL-FC\_% | -0.10 | -0.15:-0.05 | 0.000 | **0.029** | 0 |
| S-HDL-TG\_% | 0.09 | -0.01:0.19 | 0.090 | 1.000 | 68 |
| TG/PG | 0.08 | -0.01:0.18 | 0.077 | 1.000 | 60 |
| DHA/FA | -0.06 | -0.12:0.00 | 0.037 | 1.000 | 13 |
| LA/FA | 0.02 | -0.08:0.11 | 0.749 | 1.000 | 66 |
| FAw3/FA | -0.11 | -0.2:-0.02 | 0.017 | 1.000 | 60 |
| FAw6/FA | 0.00 | -0.08:0.09 | 0.965 | 1.000 | 56 |
| PUFA/FA | -0.02 | -0.11:0.07 | 0.606 | 1.000 | 62 |
| MUFA/FA | 0.03 | -0.07:0.14 | 0.531 | 1.000 | 73 |
| SFA/FA | -0.02 | -0.09:0.05 | 0.659 | 1.000 | 40 |
| ApoB/ApoA1 | 0.12 | 0.01:0.23 | 0.029 | 1.000 | 72 |

Abbreviations: B=Beta coefficient, CI=Confidence interval, I2=measure of heterogeneity, P-value=Bonferroni-Holm corrected p-value. All metabolite abbreviations can be found in e-tables 1 and 2.