**Table 1. The associations between periconceptional maternal ultra-processed food consumption and virtual reality imaging markers of first-trimester utero-placental vascular development (n=93)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | Model 1 | | | Model 2 | | | Model 3 | | |
|  | | Effect size | 95% CI | p-value | Effect size | 95% CI | p-value | Effect size | 95% CI | p-value |
| **PEI-UPF (for each 10% increase)** | |  |  |  |  |  |  |  |  |  |
|  | PV (cm3) | -0.049 | -0.110; 0.012 | 0.116 | -0.041 | -0.120; 0.038 | 0.324 | -0.066 | -0.160; 0.028 | 0.183 |
|  | uPVV (cm3) | -0.007 | -0.078; 0.064 | 0.840 | 0.020 | -0.068; 0.107 | 0.666 | -0.016 | -0.118; 0.087 | 0.772 |
|  |  |  |  |  |  |  |  |  |  |  |
|  | uPVS end points (n) | 0.069 | -1.008; 1.146 | 0.900 | 0.744 | -0.515; 2.004 | 0.258 | 0.575 | -0.875; 2.025 | 0.451 |
|  | uPVS bifurcation points (n) | 0.363 | -0.853; 1.579 | 0.558 | 1.056 | -0.481; 2.594 | 0.189 | 0.688 | -1.109; 2.486 | 0.467 |
|  | uPVS crossing points (n) | 0.189 | -0.712; 1.091 | 0.680 | 0.591 | -0.579; 1.761 | 0.333 | 0.097 | -1.286; 1.480 | 0.894 |
|  | uPVS vessel points (n) | 1.006 | -1.813; 3.826 | 0.484 | 2.752 | -0.787; 6.292 | 0.138 | 2.009 | -2.116; 6.134 | 0.355 |
|  | uPVS total length (mm) | 0.165 | -2.519; 2.849 | 0.904 | 1.667 | -1.671; 5.006 | 0.339 | 0.455 | -3.453; 4.363 | 0.825 |
|  | uPVS average thickness (mm) | -0.003 | -0.014; 0.008 | 0.573 | -0.490 | -1.815; 0.834 | 0.478 | -1.096 | -2.652; 0.460 | 0.183 |
|  |  |  |  |  |  |  |  |  |  |  |
|  | density of end points (n) | -0.005 | -0.613; 0.603 | 0.988 | -0.009 | -0.693; 0.675 | 0.980 | 0.193 | -0.621; 1.006 | 0.653 |
|  | density of bifurcation points (n) | 0.224 | -0.020; 0.469 | 0.074 | **0.295** | **0.015; 0.575** | **0.046\*** | **0.465** | **0.148; 0.782** | **0.006\*** |
|  | density of crossing points (n) | **0.149** | **0.009; 0.290** | **0.038\*** | **0.182** | **0.017; 0.348** | **0.037\*** | 0.187 | -0.010; 0.383 | 0.073 |

Model 1: adjusted for gestational age. Model 2: Model 1 additionally adjusted for maternal age, BMI, parity, conception mode, foetal sex and periconceptional alcohol consumption, smoking and folic acid supplement use. Model 3: Model 2 additionally adjusted for total energy intake. PV = placental volume. uPVV = utero-placental vascular volume. uPVS = utero-placental vascular skeleton. \*significance at p-value<0.05.

**Table 2. The associations between periconceptional maternal intake of carbohydrates and virtual reality imaging markers of first-trimester utero-placental vascular development (n=93)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | Model 3 | | |
|  | | Effect size | 95% CI | p-value |
| **Total carbohydrate intake (per 10g increase)** | |  |  |  |
|  | PV (cm3) | -0.002 | -0.016; 0.012 | 0.777 |
|  | uPVV (cm3) | **0.017** | **0.001; 0.032** | **0.044\*** |
|  |  |  |  |  |
|  | uPVS end points (n) | **0.286** | **0.062; 0.511** | **0.017\*** |
|  | uPVS bifurcation points (n) | **0.004** | **0.003; 0.006** | **0.031\*** |
|  | uPVS crossing points (n) | 0.202 | -0.007; 0.411 | 0.069 |
|  | uPVS vessel points (n) | **0.772** | **0.137; 1.408** | **0.023\*** |
|  | uPVS total length (mm) | **0.700** | **0.106; 1.295** | **0.027\*** |
|  | uPVS average thickness (mm) | 0.001 | -0.001; 0.004 | 0.288 |
|  |  |  |  |  |
|  | density of end points (n) | -0.069 | -0.192; 0.055 | 0.291 |
|  | density of bifurcation points (n) | -0.010 | -0.061; 0.041 | 0.707 |
|  | density of crossing points (n) | 0.005 | -0.026; 0.036 | 0.770 |
| **Mono-/disaccharide intake (per 10g increase)** | |  |  |  |
|  | PV (cm3) | 0.000 | -0.016; 0.016 | 0.956 |
|  | uPVV (cm3) | **0.021** | **0.003; 0.039** | **0.029\*** |
|  |  |  |  |  |
|  | uPVS end points (n) | **0.336** | **0.072; 0.603** | **0.018\*** |
|  | uPVS bifurcation points (n) | **0.380** | **0.057; 0.703** | **0.028\*** |
|  | uPVS crossing points (n) | **0.257** | **0.011; 0.502** | **0.049\*** |
|  | uPVS vessel points (n) | **0.916** | **0.170; 1.662** | **0.022\*** |
|  | uPVS total length (mm) | **0.856** | **0.158; 1.554** | **0.022\*** |
|  | uPVS average thickness (mm) | 0.002 | -0.001; 0.004 | 0.246 |
|  |  |  |  |  |
|  | density of end points (n) | -0.090 | -0.235; 0.056 | 0.242 |
|  | density of bifurcation points (n) | -0.021 | -0.081; 0.039 | 0.513 |
|  | density of crossing points (n) | 0.001 | -0.036; 0.037 | 0.967 |
| **Polysaccharide intake (per 10g increase)** | |  |  |  |
|  | PV (cm3) | -0.000 | -0.032; 0.032 | 0.986 |
|  | uPVV (cm3) | 0.008 | -0.027; 0.044 | 0.654 |
|  |  |  |  |  |
|  | uPVS end points (n) | 0.211 | -0.305; 0.726 | 0.437 |
|  | uPVS bifurcation points (n) | 0.193 | -0.440; 0.825 | 0.562 |
|  | uPVS crossing points (n) | 0.095 | -0.385; 0.576 | 0.706 |
|  | uPVS vessel points (n) | 0.530 | -0.930; 1.989 | 0.490 |
|  | uPVS total length (mm) | 0.461 | -0.903; 1.825 | 0.521 |
|  | uPVS average thickness (mm) | 0.001 | -0.004; 0.007 | 0.621 |
|  |  |  |  |  |
|  | density of end points (n) | -0.066 | -0.350; 0.217 | 0.656 |
|  | density of bifurcation points (n) | 0.006 | -0.111; 0.123 | 0.925 |
|  | density of crossing points (n) | 0.026 | -0.045; 0.098 | 0.479 |

Model 3: adjusted for gestational age, maternal age, BMI, parity, conception mode, foetal sex and periconceptional alcohol consumption, smoking and folic acid supplement use and total energy intake. Model 2 showed comparable results and is therefore not displayed. PV = placental volume. uPVV = utero-placental vascular volume. uPVS = utero-placental vascular skeleton. \*significance at p-value<0.05.

**Table 3. The associations between periconceptional maternal adherence to a Western, Mediterranean and Snack dietary pattern and virtual imaging markers of first-trimester utero-placental vascular development (n=93)**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | Model 2 | | | Model 3 | | |
|  | | Effect size | 95% CI | p-value | Effect size | 95% CI | p-value |
| **Western dietary pattern** | |  |  |  |  |  |  |
|  | PV (cm3) | -0.008 | -0.098; 0.081 | 0.857 | -0.004 | -0.128; 0.119 | 0.948 |
|  | uPVV (cm3) | 0.018 | -0.080; 0.116 | 0.722 | 0.039 | -0.096; 0.175 | 0.581 |
|  |  |  |  |  |  |  |  |
|  | uPVS end points (n) | 0.560 | -0.908; 2.029 | 0.464 | 1.247 | -0.722; 3.215 | 0.230 |
|  | uPVS bifurcation points (n) | 0.463 | -1.296; 2.222 | 0.614 | 1.571 | -0.817; 3.959 | 0.213 |
|  | uPVS crossing points (n) | 0.337 | -0.981; 1.655 | 0.624 | 0.923 | -0.895; 2.741 | 0.335 |
|  | uPVS vessel points (n) | 1.188 | -2.892; 5.267 | 0.576 | 3.975 | -1.533; 9.484 | 0.172 |
|  | uPVS total length (mm) | 1.181 | -2.615; 4.977 | 0.551 | 2.746 | -2.470; 7.962 | 0.316 |
|  | uPVS average thickness (mm) | -0.038 | -1.509; 1.433 | 0.961 | -0.709 | -2.772; 1.354 | 0.513 |
|  |  |  |  |  |  |  |  |
|  | density of end points (n) | 0.086 | -0.685; 0.858 | 0.830 | 0.332 | -0.750; 1.414 | 0.560 |
|  | density of bifurcation points (n) | -0.080 | -0.407; 0.246 | 0.638 | 0.307 | -0.138; 0.752 | 0.192 |
|  | density of crossing points (n) | -0.011 | -0.209; 0.186 | 0.913 | 0.168 | -0.104; 0.441 | 0.243 |
| **Mediterranean dietary pattern** | |  |  |  |  |  |  |
|  | PV (cm3) | 0.026 | -0.061; 0.113 | 0.566 | 0.027 | -0.068; 0.121 | 0.592 |
|  | uPVV (cm3) | 0.042 | -0.055; 0.138 | 0.409 | 0.079 | -0.020; 0.178 | 0.133 |
|  |  |  |  |  |  |  |  |
|  | uPVS end points (n) | -0.288 | -1.713; 1.136 | 0.698 | 0.226 | -1.218; 1.670 | 0.766 |
|  | uPVS bifurcation points (n) | 0.346 | -1.388; 2.081 | 0.702 | 1.069 | -0.701; 2.340 | 0.252 |
|  | uPVS crossing points (n) | 0.637 | -0.664; 1.939 | 0.348 | 1.130 | -0.210; 2.471 | 0.111 |
|  | uPVS vessel points (n) | 0.188 | -3.830; 4.206 | 0.928 | 1.878 | -2.217; 5.973 | 0.384 |
|  | uPVS total length (mm) | 1.472 | -2.257; 5.201 | 0.449 | 3.000 | -0.799; 6.800 | 0.136 |
|  | uPVS average thickness (mm) | 0.796 | -0.661; 2.253 | 0.296 | 1.068 | -0.460; 2.597 | 0.186 |
|  |  |  |  |  |  |  |  |
|  | density of end points (n) | -0.433 | -1.184; 0.319 | 0.271 | -0.596 | -1.386; 0.194 | 0.154 |
|  | density of bifurcation points (n) | -0.287 | -0.551; 0.018 | 0.081 | -0.281 | -0.604; 0.042 | 0.100 |
|  | density of crossing points (n) | -0.156 | -0.600; 0.026 | 0.091 | -0.068 | -0.267; 0.131 | 0.514 |
|  |  |  |  |  |  |  |  |
| **Snack dietary pattern** | |  |  |  |  |  |  |
|  | PV (cm3) | 0.007 | -0.078; 0.091 | 0.875 | 0.039 | -0.110; 0.187 | 0.624 |
|  | uPVV (cm3) | **0.105** | **0.006; 0.204** | **0.044\*** | 0.102 | -0.070; 0.274 | 0.263 |
|  |  |  |  |  |  |  |  |
|  | uPVS end points (n) | 1.350 | -0.122; 2.823 | 0.081 | 0.697 | -1.843; 3.236 | 0.602 |
|  | uPVS bifurcation points (n) | 1.670 | -0.107; 3.449 | 0.074 | 1.454 | -1.615; 4.523 | 0.368 |
|  | uPVS crossing points (n) | 1.322 | -0.011; 2.655 | 0.058 | 1.257 | -1.065; 3.579 | 0.304 |
|  | uPVS vessel points (n) | 3.863 | -0.257; 7.983 | 0.075 | 2.910 | -4.191; 10.011 | 0.436 |
|  | uPVS total length (mm) | **4.058** | **0.243; 7.874** | **0.044\*** | 3.025 | -3.613; 9.663 | 0.387 |
|  | uPVS average thickness (mm) | 1.128 | -0.375; 2.631 | 0.152 | 1.069 | -1.554; 3.692 | 0.439 |
|  |  |  |  |  |  |  |  |
|  | density of end points (n) | -0.628 | -1.412; 0.156 | 0.127 | -0.829 | -2.206; 0.547 | 0.253 |
|  | density of bifurcation points (n) | -0.236 | -0.568; 0.097 | 0.176 | -0.144 | -0.717; 0.429 | 0.632 |
|  | density of crossing points (n) | -0.003 | -0.204; 0.198 | 0.979 | 0.002 | -0.350; 0.353 | 0.993 |

Model 2: adjusted for gestational age, maternal age, BMI, parity, conception mode, foetal sex and periconceptional alcohol consumption, smoking and folic acid supplement use. Model 3: Model 2 additionally adjusted for total energy intake. PV = placental volume. uPVV = utero-placental vascular volume. uPVS = utero-placental vascular skeleton. \*significance at p-value<0.05.