

Fetal and infant neurodevelopment according to a life-style intervention during pregnancy

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Objective

To assess whether a Mediterranean diet (MedDiet) or a Mindfulness-Based Stress Reduction (MBSR) intervention during pregnancy affects fetal cortical development and newborns' neurobehavior.

Methods

In a randomized clinical trial with parallel-groups conducted at University Hospital in Barcelona, Spain (2017-2020), 1221 pregnant women at high-risk were randomly allocated at 19-23 weeks' gestation into three groups: MedDiet intervention, MBSR program or non-intervention. Participants in the MedDiet group received monthly individual and group educational sessions and extra-virgin olive oil and walnuts. Women in the MBSR group underwent an 8-week MBSR program adapted for pregnancy. A detailed neurosonography (NSG) was performed at 33-34 weeks of gestation, measuring biparietal diameter (BPD), occipitofrontal diameter (OFD), insula depth, Sylvian fissure, parieto-occipital sulci (POS), cingulate sulci, calcarine sulci, corpus callosum length and vermian height. Data were normalized by BPD or OFD. Neonatal Behavioral Assessment Scale (NBAS) was performed at 1-2 months after birth including the following 6 clusters: Habituation, Motor, Autonomic stability, Social-interactive, Range of states and Regulation of states. Data were adjusted by maternal socioeconomic status, gestational age at delivery, birthweight, sex, postnatal age at examination and breastfeeding.

Results

Among participants of the trial, NSG and NBAS was performed in 883 participants (n=300 MedDiet, n=281 MBSR, n=302 non-intervention). Measurements of BPD and OFD were similar among study groups. Fetuses from the MedDiet group showed larger insula (26.80mm vs. 26.63mm $p=0.01$), deeper POS (13.14mm vs. 12.90mm, $p=0.04$) and a tendency of longer corpus callosum (42.98mm vs. 42.68mm $p=0.06$), compared to fetuses from the non-intervention group. No significant differences were observed in MBSR group. At NBAS examination, newborns from MedDiet had significantly higher scores in Autonomic stability (mean 7.4 (0.9) vs 7.6 (0.7), $p=0.04$), Social-interactive (mean 7.5 (1.5) vs 7.8 (1.3), $p=0.03$) and Range of states (mean 4.3 (1.1) vs 4.5 (1.0), $p=0.04$), than non-intervention. Newborns from MBSR had significantly higher scores in Regulation of states (mean 6.0 (1.8) vs 6.5 (1.5), $p=0.009$) than non-intervention.

Conclusion

Maternal lifestyle interventions during pregnancy based on MedDiet or MBSR program affect fetal cortical development and newborn's neurobehavior. Further research to elucidate the underlying mechanisms is warranted.